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Specification and Drawings, as originally filed, with Application for Patent Serial No: **CA 2420624**, on January 24, 2003, by **DAVID CARL DRUMMOND**, for "Pressure Operable Liquid Pumping System".

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ABSTRACT OF THE DISCLOSURE

A pressure operable liquid pumping system for pumping liquid from a container comprises a liquid intake hose having a liquid inlet end insertable into liquid in the container, a fitting for engaging the aperture of the container in sealed relation, and a liquid transport hose having a liquid outlet end. A pump is used to pump air into the container. The pump is also connected in sealed air-delivery relation to the container at the aperture, thereby permitting delivery of air from the pump into the container through the aperture, so as to thereby effect a positive air pressure in the container, thus causing the liquid to flow from the container, through the liquid intake hose, the fitting, and the liquid transport hose, to the destination. The pump may also be connected in sealed air-delivery relation to the container at a second aperture.

FIELD OF THE INVENTION

[0001] The present invention relates to pressure operable pumping systems for pumping fluid, and more particularly to manually powered pressure operable pumping systems that use pressure for pumping liquids, as opposed to suction.

BACKGROUND OF THE INVENTION

[0002] In many instances, it is necessary to pump a liquid, such as gasoline, water, and so on, from a first container, into a second container. The first container might be a transportable container such as a plastic or metal can used for transporting gasoline, commonly called a "Jerry can", or similar. The second container might be a gas tank on a vehicle, a snowmobile, a lawnmower, and so on, or might be another transportable container.

[0003] Where the liquid cannot be poured from the first container to the second container, for various reasons, such as safety, the process of transferring liquids is commonly performed by siphoning the liquid from the first container into the second container. It is well known to use one's mouth to start the siphoning process; however, this is often very undesirable,

especially if a liquid such as gasoline is being siphoned. Accordingly, various types of pumps exist to make the process less undesirable, less dangerous, quicker, and so on.

[0004] In spite of the general availability of pumps that might be suitable for pumping liquids from one container to another, it is uncommon for individuals to have readily available a pump that can be used in a situation such as filling a lawnmower gas tank, filling a vehicle gas tank (if the vehicle has run out of gasoline), filling a boat gas tank, and so on. It is much more common to merely pour the gasoline from a container.

[0005] It is believed that part of the reason for this manner of transferring gasoline is that there is a definite lack of ready-to-use, inexpensive pumping systems that are suitable for pumping liquids, especially gasoline from a first container to a second container.

[0006] There are also other instances where pumping a liquid, such as gasoline, is very difficult, and indeed, possibly even somewhat dangerous, due to the nature of the liquid. For instance, when removing gasoline from a gasoline tank in a vehicle, the only known way in the prior art to accomplish this is to siphon the gasoline. The method of siphoning is a nuisance, and is even

potentially dangerous when transferring gasoline since it is common for a person to suck on the transfer hose in order to start the siphoning action. Further, the end container must be below the level of the gasoline tank.

[0007] The only known prior art pumping system that is ready-to-use and may be suitable for pumping liquids, such as gasoline, in some situations, is a siphoning pump that can be used to transfer liquid from a raised container to a container, tank, or the like, located at a lower elevation. Such a siphoning pump is disclosed in U.S. Patent No. 6,412,528 issued July 2, 2002 to Alex *et al.* This manually operative siphoning pump comprises a pump mechanism disposed within a housing. The housing has an extended handle that leads to an inlet hose and also has a tubular outlet nozzle. A pump mechanism disposed within the housing comprises a cylindrical pump body disposed in fluid communication with the inlet hose and the tubular outlet nozzle. A cylindrical head mounted on an elongate cylindrical stem moves axially within the pump body to pump liquids from the inlet hose to the outlet hose disposed within the tubular outlet nozzle. The elongate cylindrical stem has a male retaining bulb seated within a female retaining bulb that is part of a bellows. A lever arm is pivotally mounted on the extended handle and engages the male retaining bulb to permit manual operation of the pump mechanism. The pump mechanism acts as

a siphon to suction liquids from whatever source that the inlet hose is in fluid communication with.

[0008] There are at least three very distinct disadvantages to the siphoning pump apparatus disclosed in U.S. Patent No. 6,412,528. Firstly, since this is a siphoning type of apparatus, the source of liquid must be located at an elevation above the pump and the destination container. This is extremely undesirable in situations where one might be filling a gas tank on a vehicle and must hold a portable gas can several feet in the air during the entire pumping operation, which might last several minutes. Further, there may be instances where the source of liquid is in a container, or the like, that cannot be elevated, such as if it is a permanent structure or is far too heavy to lift. In this case, the siphoning pump disclosed in the Alex *et al* patent would not work.

[0009] A second serious disadvantage relates to siphoning pressure limitations. Since the pump is only hand-operable by design, the maximum force that can be expected to be applied to the pumping mechanism is quite low. Accordingly, the pumping mechanism cannot be overly large and also has a limited maximum pumping throughout, that has been found to be lower than is desirable. Further, since the siphoning pump in the Alex *et al* patent

necessitates hand operation, the duration that an individual can use this siphoning apparatus is generally quite limited.

[00010] It is an object of the present invention to provide a pressure operated pump for pumping liquids from one container to another.

[00011] It is an object of the present invention to provide a pressure operated pump for pumping liquids from one container to another, wherein the pumping mechanism and the destination can be at a the same elevation or at a higher elevation than the source.

[00012] It is another object of the present invention to provide a pressure operated pump for pumping gasoline from one container to another.

[00013] It is another object of the present invention to provide a pressure operated pump for pumping gasoline from a gasoline tank in a vehicle to a destination.

SUMMARY OF THE INVENTION

[00014] In accordance with one aspect of the present invention there is disclosed a novel pressure operable liquid pumping system for pumping liquid from a container having an aperture to a destination. The pressure operable liquid pumping system comprises a pump means for pumping air into the container. A liquid delivery hose means is for delivering liquid from the container to the destination and has, in seriatim, a liquid intake section having a liquid inlet and being insertable into liquid in the container such that the liquid inlet is in liquid receiving relation with the container, a fitting for engaging the aperture of the container in sealed relation, and a liquid transport hose section having a liquid outlet end, with the liquid intake hose section and the liquid transport hose section in fluid communication one with the other. There is also means for connecting the pump means in sealed air-delivery relation to the container at the aperture, thereby permitting delivery of air from the pump means into the container through the aperture, so as to thereby effect a positive air pressure in the container. The positive air pressure in the container causes the liquid to flow from the container, through the liquid delivery hose means, and to the destination.

[00015] In accordance with another aspect of the present invention there is disclosed a novel pressure operable liquid pumping system for pumping liquid from a container having a first

aperture and a second aperture, to a destination. The pressure operable liquid pumping system comprises a pump means for pumping air into the container. A liquid delivery hose means is for delivering liquid from the container to the destination and has, in seriatim, a liquid intake section having a liquid inlet and being insertable into liquid in the container such that the liquid inlet is in liquid receiving relation with the container, a fitting for engaging the first aperture of the container in sealed relation, and a liquid transport hose section having a liquid outlet end, with the liquid intake hose section and the liquid transport hose section in fluid communication one with the other. There is also means for connecting the pump means in sealed air-delivery relation to the container at the second aperture, thereby permitting delivery of air from the pump means into the container through the second aperture, so as to thereby effect a positive air pressure in the container. The positive air pressure in the container causes the liquid to flow from the container, through the liquid delivery hose means, and to the destination.

[00016] In accordance with yet another aspect of the present invention there is disclosed a novel method of pumping liquid from a container having an aperture, to a destination. The method comprises the steps of connecting an air pump means in sealed air-delivery relation to the container through the aperture, connecting

a liquid delivery hose means in sealed liquid receiving-relation to the container at the aperture such that the inlet end of the liquid delivery hose means is submerged in liquid in the container, and pumping air into the container so as to cause the liquid to flow from the container, through the liquid delivery hose means, and to the destination.

[00017] Other advantages, features and characteristics of the present invention, as well as methods of operation and functions of the related elements of the structure, and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following detailed description and the appended claims with reference to the accompanying drawings, the latter of which is briefly described herein below.

BRIEF DESCRIPTION OF THE DRAWINGS

[00018] The novel features which are believed to be characteristic of the pressure operable pumping system and method according to the present invention, as to its structure, organization, and use, together with further objectives and advantages thereof, will be better understood from the following drawings in which a presently preferred embodiment of the invention

will now be illustrated by way of example. It is expressly understood, however, that the drawings are for the purpose of illustration and description only, and are not intended as a definition of the limits of the invention. In the accompanying drawings:

[00019] **Figure 1** is a perspective pictorial view of the first preferred embodiment of the pressure operable liquid pumping system according to the present invention, showing the fitting in place in the mouth of a conventional portable gasoline container;

[00020] **Figure 2** is an enlarged perspective view of the gasoline can fitting of the pressure operable liquid pumping system of Figure 1, which gasoline can fitting is fitted into the mouth of the conventional portable gasoline can containing the liquid being pumped;

[00021] **Figure 3** is an end view of the exterior end of the gasoline can fitting of Figure 2;

[00022] **Figure 4** is an end view of the exterior end of the gasoline can fitting of Figure 2;

[00023] **Figure 5** is a sectional side elevational view of the gasoline can fitting of Figure 2, taken along section line 5-5;

[00024] **Figure 6** is a cross-sectional side elevational view of the gasoline can fitting of Figure 2, in place in a conventional portable gasoline can;

[00025] **Figure 7** is a side elevational view of the handheld dispenser unit of the pressure operable liquid pumping system of Figure 1;

[00026] **Figure 8** is a cross-sectional side elevational view of the handheld dispenser unit of Figure 7, with the valve mechanism in a closed position so as to preclude the flow of liquid through the valve mechanism;

[00027] **Figure 9** is an enlarged cross-sectional side elevational view of a portion of the valve mechanism of the handheld dispenser unit of Figure 8;

[00028] **Figure 10** is a cross-sectional side elevational view of the handheld dispenser unit of Figure 7, with the valve mechanism in an open position so as to permit the flow of liquid through the valve mechanism;

[00029] **Figure 11** is a top plan view of the handheld dispenser unit of Figure 7;

[00030] **Figure 12** is a sectional end elevational view of the handheld dispenser unit of Figure 7, taken along section line 12-12 of Figure 11;

[00031] **Figure 13** is a sectional end elevational view of the handheld dispenser unit of Figure 7, taken along section line 13-13 of Figure 11;

[00032] **Figure 14** is a perspective pictorial view of the second preferred embodiment of the pressure operable liquid pumping system according to the present invention, showing the fitting in place in the mouth of a conventional portable gasoline container;

[00033] **Figure 15** is a sectional side elevational view of the gasoline can fitting of Figure 14, in place in a conventional portable gasoline can, taken along section line 15-15;

[00034] **Figure 16** is a sectional side elevational view of the secondary gasoline can cap of Figure 14, in place in a conventional portable gasoline can, taken along section line 16-16;

[00035] **Figure 17** is a side elevational view of the third preferred embodiment of the pressure operable liquid pumping system according to the present invention, showing the fitting in place in the mouth of a conventional water bottle;

[00036] **Figure 18** is a cross-sectional view of the fourth preferred embodiment pressure operable liquid pumping system, showing the fitting and the fitting adapter;

[00037] **Figure 19** is a cross-sectional view of the fitting shown in Figure 18;

[00038] **Figure 20** is a cross-sectional view of the fitting adapter shown in Figure 18;

[00039] **Figure 21** is a side elevational view of the fitting of a fifth preferred embodiment of the pressure operable liquid pumping system according to the present invention;

[00040] **Figure 22** is a side elevational view of a portion of the sixth preferred embodiment of the pressure operable liquid pumping

system according to the present invention, for installation onto the inlet of the filler pipe of a gas tank of a vehicle;

[00041] **Figure 23** is an exploded side elevational view of the pressure operable liquid pumping system of Figure 19;

[00042] **Figure 24** is a plan view of the inlet of the gas tank of a vehicle, with the hinged shutter in a closed position;

[00043] **Figure 25** is a view similar to Figure 21, but with the hinged shutter in an open position and the pressure operable liquid pumping system of Figure 19 inserted into the inlet;

[00044] **Figure 26** is a cross-sectional side elevational view of the pressure operable liquid pumping system shown in Figure 22 inserted into the inlet of the filler pipe of a gas tank of a vehicle, taken along section line 26-26 of Figure 25;

[00045] **Figure 27** is a exploded side elevational view of the seventh preferred embodiment of the pressure operable liquid pumping system according to the present invention; and,

[00046] **Figure 28** is a side elevational view of the eighth preferred embodiment of the pressure operable liquid pumping system

according to the present invention, with the fitting inserted into the mouth of a conventional portable gasoline can.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[00047] Referring to Figures 1 through 28 of the drawings, it will be noted that Figures 1 through 13 illustrate a first preferred embodiment of the pressure operable pumping system and method of the present invention, Figures 14 through 16 illustrate a second preferred embodiment of the pressure operable pumping system and method of the present invention, and Figure 17 illustrates a third preferred embodiment of the pressure operable pumping system and method of the present invention.

[00048] Reference will now be made to Figures 1 through 13, which show a first preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 20, according to the present invention. The pressure operable liquid pumping system 20 is for pumping liquid from a container, such as a conventional portable gasoline container 22, a gasoline tank in a vehicle, a water bottle, and so on, to a destination, such as a container, a gasoline tank in a vehicle, another conventional portable gasoline container, and so on. The

container must have an aperture, such as a mouth 24 on the conventional portable gasoline container 22, and be substantially sealable such that there can be an air pressure build-up in the container. The increased air pressure is used to essentially push liquid from the container, through a fitting that seals the aperture of the container.

[00049] In the first preferred embodiment, as illustrated, the pressure operable liquid pumping system 20 comprises a pump means in the form of a manually operable air pump 30, a liquid delivery hose means, as indicated by the general reference numeral 40, that has a liquid intake section 50, a fitting 60, and a liquid transport hose section 70, and a handheld dispenser unit as indicated by the general reference numeral 80, containing a selectively operable valve means as indicated by the general reference numeral 90.

[00050] The various elements of the first preferred embodiment pressure operable liquid pumping system 20 and related method, will now be described in greater detail with reference to Figure 1 through 13.

[00051] The manually operable air pump 30 comprises a foot operable air pump 30 having a hollow rubber hemi-spherical air

bladder 32 an outlet nozzle 34 and a plurality of inlet openings 36 surrounding the outlet nozzle 34. The hollow rubber hemi-spherical air bladder 32 is compressed, typically by a person stepping on it, or is otherwise compressed, to expel air out of the outlet nozzle 34. The hollow rubber hemi-spherical air bladder 32 is resilient so as to suction air into its interior through the plurality of inlet openings 36. Alternatively, other types of pumps, including electrically operated air pumps could be used; however, there are safety considerations when pumping volatile liquids such as gasoline.

[00052] The liquid delivery hose means 40, as can be best seen in Figure 1, is for delivering liquid from a container, such a the conventional portable gasoline container 22, to a destination, such as a gasoline tank in a vehicle, another conventional portable gasoline container, and so on. The liquid delivery hose means 40 has, in seriatim, the liquid intake section 50, the fitting 60 for engaging the aperture of the convention portable gasoline container 22, and the liquid transport hose section 70.

[00053] As can be best seen in Figures 5 and 6, in the first preferred embodiment, the fitting 60 is a gasoline can fitting 60 for fitment onto the mouth 24 of the conventional portable gasoline container 22. The gasoline can fitting 60 has a cylindrical main

body 61 with a generally centrally located annular flange 62 that divides the cylindrical main body 61 longitudinally into an insertable portion 63 and an exterior portion 64. The annular flange 62 is of sufficient diameter to preclude the gasoline can fitting 60 from passing through the mouth 24 of the conventional portable gas container 22. The diameter of the insertable portion 63 of the main body is just slightly smaller than the diameter of the mouth 24 of the portable gas container 22 so as to readily be situatable therein. The diameter of the exterior portion 64 of the main body 61 is just slightly smaller than the interior diameter of the cap 26 of the portable gas container 22 so as to permit the cap 26 to be threadibly engaged on the threads of the mouth 24 of the portable gas container 22. The insertable portion 63 of the gasoline can fitting 60 has an "O"-ring 65 disposed in abutting relation against the generally centrally located annular flange 62 to ensure that the cap 26 is in sealed relation against the gasoline can fitting 60. The gasoline can fitting 60 is secured in place on the portable gas container 22 by the conventional threaded cap 26 of the portable gas container 22, in the same manner as the gooseneck type gas delivery spout would be kept in place by the cap 26.

[00054] The air inlet nozzle 66 and liquid outlet nozzle 67, both project outwardly from the exterior portion 64 of the gasoline can

fitting 60. A liquid receiving nozzle 68 projects outwardly from the insertable portion 63 of the gasoline can fitting 60. Each of the air inlet nozzle 66, the liquid outlet nozzle 67, and the liquid receiving nozzle 68 is appropriately serrated so as to securely retain hoses connected thereto, as will be described in grater detail subsequently.

[00055] The air inlet nozzle 66 is in fluid communication with the end face 63e of the insertable portion 63 of the gasoline can fitting 60 through a borehole 69a. The borehole 69a acts as an air ingress passageway through the gasoline can filling 60. The liquid outlet nozzle 67 is axially aligned with and is in fluid communication with the liquid receiving nozzle 68 through a common borehole 69b. The common borehole 69b acts as a liquid egress passageway that connects the liquid intake section 50 and the liquid transport hose section 70 in fluid communication one with the other.

[00056] There is also means for connecting the pump means sealed air delivery relation to the conventional portable gasoline container 22 at its mouth 24, thereby permitting delivery of air from the manually operable air pump 30 into the conventional portable gasoline container 22 through its mouth 24, so as to thereby affect a positive air pressure in the gasoline container

22. In the preferred embodiment as illustrated, the means for connecting the manually operable air pump 30 in sealed air delivering relation to the conventional portable gasoline container 22 at its mouth 24 comprises the air supply hose 78 and the air inlet nozzle 66 disposed on the gasoline can fitting 60. The air supply hose 78 is connected at its air delivery end 78a to the air inlet nozzle 66 so as to be in air delivering relation to the conventional portable gasoline container 22 through the air ingress passageway, namely the borehole 96a. The air supply hose 78 is also connected at its air receiving end 78b to the air outlet nozzle 34 of the manually operable air pump 30, to thereby permit delivery of air from the manually operable air pump 30 into the conventional portable gasoline container 22, through its mouth 24. In this manner, a positive air pressure is effected in the conventional portable gasoline container 22.

[00057] In the first preferred embodiment, as illustrated, and is as best seen in Figure 1, the liquid intake section 50 comprises a liquid intake hose section that, in the first preferred embodiment, is an individual liquid intake hose 51 having a liquid inlet end 51a and a liquid outlet end 51b. A liquid inlet is disposed at the inlet end 51a. The liquid intake hose 51 should be of sufficient length to extend to the bottom of a conventional portable gas container 22, such as a five gallon or a ten gallon conventional

portable gas container. The liquid intake hose 51 is insertable into liquid in the conventional portable gasoline container 22 such that the liquid inlet 53 is in liquid receiving relation within the conventional portable gasoline container 22. Preferably, a suitable filter 58 is fitted onto the liquid inlet end 51a of the liquid intake hose 51, to preclude dirt, debris, and the like, from being pumped into the liquid intake hose 51 and passing through the fitting 60, the liquid transport hose section 70, and the handheld dispenser unit 80, containing the selectively operable valve means 90.

[00058] The liquid outlet end 51b of the liquid intake hose 51 is securely connected in sealed liquid transport relation to the liquid receiving nozzle 68 on the interior end of a gasoline can fitting 60, such that the liquid intake hose 51 is in fluid communication with the common borehole 69b, which is the liquid egress passageway.

[00059] In the first preferred embodiment, as illustrated, and is as best seen in Figures 1, the liquid transport hose section 70 comprises an individual liquid transport hose 71 having a liquid inlet end 71a and a liquid outlet end 71b. The liquid transport hose 71 is connected at the liquid inlet end 71a in sealed liquid receiving relation to the liquid outlet nozzle 67 of the fitting 60

so as to be in fluid communication with the common borehole 69b, which is the liquid egress passageway, thereby permitting liquid to be transported from the portable gas container 22 to the handheld dispenser unit 80.

[00060] The handheld dispenser unit 80 comprises a hand grip portion 82 disposed at the inlet end 83 of the handheld dispenser unit 80. A finger operable trigger member 84 is pivotally mounted on the hand grip portion 82 of the handheld dispenser unit 80 by means of a threaded fastener 85, for movement between a liquid flow-precluding position, as is best seen in Figures 8 and 9, and a liquid dispensing position, as is best seen in Figure 10. A curved dispensing spout 86 is disposed at the delivery end 87 of the handheld dispenser unit 80, and is shaped and dimensioned to fit loosely into conventional inlet to a gas tank on a vehicle, lawn mower, and so on. A central valve housing portion 88 interconnects the hand grip portion 82 and the curved dispensing spout 86 and houses the valve means 90 that is used to selectively preclude and permit the flow of liquid from the handheld dispenser unit 80, as will be discussed in greater subsequently. A protective handle portion 89 is disposed below the hand grip portion 82 so as to help preclude the finger operable trigger member 84 from being accidentally actuated.

[00061] The valve means 90 has a cylindrically shaped main housing 92 located above a cylindrically shaped shaft receiving housing 94 having a smaller diameter than the main housing 92. A valve member 96 has a plunger portion 98 disposed within the main housing 92 and a shaft portion 99 disposed within the shaft receiving housing 94. An "O"-ring 100 seated in a co-operating annular channel 102 in the plunger portion 98 and an "O"-ring 104 seated in a co-operating annular channel 106 in the shaft portion 99 preclude liquid from escaping from the interior 91 of the valve mechanism 90. The valve member 96 is axially slidable between a flow-precluding position, as is best seen in Figures 8 and 9 and corresponding to the flow-precluding position of the trigger member 84, and a flow permitting position, as best seen in Figure 10 and corresponding to the flow-permitting position of the trigger member 84, and is biassed to its flow precluding position by a compressed coil spring 108 retained within a spring pocket 109 and acting between the plunger portion 98 of the valve member 96 and the outer wall 81 of the handheld dispenser unit 80. The shaft portion 99 has a narrow throat portion 110 that permits passage of liquid through the valve mechanism 90 when the valve member 96 is in its flow-permitting position, as indicated by arrow "B" in Figure 10. An "O"-ring 112 mounted on the valve member 96 immediately below the plunger portion 98 contacts a flat seating surface 114 in sealed relation thereto when the valve member 96 is in its flow

precluding position, so as to fully preclude the flow of liquid through the valve mechanism 90.

[00062] A liquid inlet nozzle 120 is located rearwardly of the shaft receiving housing 94 and is in fluid communication with the interior of the shaft receiving housing 94. The outlet end 71b of the flexible liquid transport hose 71 is connected to the liquid inlet nozzle 120 to permit delivery of liquid into the valve mechanism 90. In the above described manner, the selectively operable valve means 90 is operatively mounted on the liquid delivery hose means 40.

[00063] A liquid delivery nozzle 122 is located forwardly of the main housing 92 and is in fluid communication with the interior of the main housing 92. A liquid dispensing hose 124 is connected to the liquid delivery nozzle 122 to permit delivery of liquid from the valve mechanism 90 and subsequent dispensing of the liquid from the curved dispensing spout 86.

[00064] The valve mechanism 90 is captured between a left half 80l and a right half 80r of the handheld dispenser unit 80, and more specifically is retained within the central valve housing portion 88 between a left square-shaped mount 120l located on the left half

80l of the handheld dispenser unit 80 a right square-shaped mount 120r located on the right half 80r of the handheld dispenser unit 80, so as to face each other in aligned relation. The left and right square-shaped mounts 120l,120r have suitable apertures to receive the liquid inlet nozzle 120, the liquid delivery nozzle 122, the main housing 92 of the valve, and the shaft receiving housing 94 of the valve mechanism 90.

[00065] Use of the pressure operable liquid pumping system 20 will now be described. In use, the manually operable air pump 30 is stepped on to produce pressurized air flow therefrom through its outlet nozzle 34. This pressurized air passes through the air supply hose 78 and through the gasoline can fitting 60, via the borehole 69a in the air inlet nozzle 66, and into the portable gas container 22. The air within the portable gas container 22 becomes pressurized, thus forcing the gasoline out of the portable gas container 22 through the liquid intake hose 51 and through the common borehole 69b in the liquid receiving nozzle 68 and the liquid outlet nozzle 67. The gasoline then travels through the flexible liquid transport hose 70 and into the valve mechanism 90. As can be best seen in Figure 10, with the valve mechanism 90 in its flow-permitting position, gasoline enters the liquid inlet nozzle 120 of the valve mechanism 90 as indicated by arrow "A", passes by the narrow throat portion of the plunger portion 98, as

indicated by arrow "B", and enters the central chamber of the valve mechanism 90 as indicated by arrow "C", and then exits the valve mechanism 90 via the liquid delivery nozzle 122, as indicated by arrow "D". The gasoline is then dispensed from the curved dispensing spout 86 through the liquid dispensing hose within the delivery nozzle and secured to the liquid delivery nozzle 122 of the valve mechanism 90, as indicated by arrow "E". If the valve mechanism 90 is in its flow-precluding position, as can be best seen in Figures 8 and 9, flow of the gasoline is precluded.

[00066] Reference will now be made to Figures 14 through 16, which show a second preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 200, according to the present invention. The second preferred embodiment pressure operable liquid pumping system 200 is similar to the first preferred embodiment pressure operable liquid pumping system 20, except that the fitting 260 there has only a single borehole 269b in the fitting 260. The borehole 269b acts as a liquid egress passageway that connects the liquid intake hose 251 and the liquid transport hose 271 in fluid communication one with the other, as can be best seen in Figure 15. Figure 16 shows a secondary gasoline can cap having an air inlet nozzle 266 thereon and a borehole 269a that acts as an air ingress passageway.

The air supply hose 278 is connected at its air delivery end to the air inlet nozzle 266.

[00067] Reference will now be made to Figure 17, which shows a third preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 300, according to the present invention. The third preferred embodiment pressure operable liquid pumping system 300 is similar to the first preferred embodiment pressure operable liquid pumping system 20, except that the fitting 360 comprises a tapered main body 362 that is suitable for fitment into the mouth 324 of a conventional water bottle 322, or even the mouth of a portable gasoline container (not shown). Preferably, the tapered outer wall 361 of the fitting 360 has a coarse thread to permit the fitting 360 to be properly retained within a container, when the container is air pressurized.

[00068] An alternative type of handheld dispenser unit 380 is shown in Figure 14. The handheld dispenser unit 380 has a "C"-shaped handle portion and a threaded "T"-handled rod that together act as a "C"-clamp that is used to clamp the handheld dispenser unit 380 in place, such as on a counter, or the like. The valve mechanism (not specifically shown) within the handheld dispenser unit 380 works in the same manner as the valve mechanism 90 of the

first preferred embodiment pressure operable liquid pumping system 20.

[00069] Also, a bellows type air pump 330 is shown, which works in the same manner as the manually operable air pump 30 of the first preferred embodiment pressure operable liquid pumping system 20.

[00070] Reference will now be made to Figures 18 through 20, which show a fourth preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 400, according to the present invention. The fourth preferred embodiment pressure operable liquid pumping system 400 is similar to the first preferred embodiment pressure operable liquid pumping system 20, except that the fitting 460 is tapered. The fitting 460 also has a serrated air inlet nozzle 466 that receives the air supply hose 478 securely thereon. A first borehole 469a extends through the main body 462 and the air inlet nozzle 466, to permit air to be pumped through the fitting 460 and into a container, such as a gasoline tank in a vehicle. A second larger borehole 469b receives a plastic tube therethrough, which plastic tube is the liquid intake hose 451 and the liquid transfer hose 471.

[00071] Additionally, there is a guide member 402 having an upper cylindrical portion 404 and a lower tapered portion 405 with air holes 406 therein. A throughpassage 408 extends from the top end 402t of the guide member 402 to the bottom end of the guide member 402. The liquid transfer hose 471 extends through the passage of the guide member 402 and through the second borehole 469b of the fitting 460.

[00072] In use, the guide member 402 is engaged on the liquid intake hose section 451 and remains in place thereon as the opening 403 at the bottom end 402b of the tapered portion 404 of the guide member 402 is suitably sized to permit the guide member 402 to frictionally engage the liquid intake hose section 451. The liquid intake hose section 451 and the guide member 402 are inserted into the inlet 410 of the filler pipe 412 of a gasoline tank of a vehicle to the appropriate depth. The fitting 460 is then slid along the liquid intake hose section 451 of the plastic tube toward the inlet 410 of the filler pipe 412, and is partially inserted into the filler pipe 412 so as to be received in sealed relation therein, thus sealing off the only opening to the gasoline tank. Air is then pumped from the air pump (not shown) through the air supply 478, through the fitting 460 and then through the throughpassage 408 of the guide member 402 and out through the air holes 406 in the lower tapered portion 404 of the guide member 402

and along the filler pipe 412 into the gasoline tank. Gasoline is thereby forced up the liquid intake hose 451, to its destination.

[00073] Reference will now be made to Figure 21, which shows part of a fifth preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 500, according to the present invention. The fifth preferred embodiment pressure operable liquid pumping system 500 is similar to the fourth preferred embodiment pressure operable liquid pumping system 400, except that the serrated air inlet nozzle 566 is removable and replaceable by means of a threaded portion 567 at its lower end, which threadibly engages a cooperating threaded portion 569t disposed at the upper end of the first borehole 569a. Such a removable and replaceable air inlet nozzle 566 permits a suitable diameter air inlet nozzle 566 to be used, depending on the diameter of the air supply hose 578 that is available, or desired.

[00074] Reference will now be made to Figures 22 through 26, which show a sixth preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 600, according to the present invention. The sixth preferred embodiment pressure operable liquid pumping system 600 is similar to the first preferred embodiment pressure operable liquid pumping system 20, except that there is also an additional

adapter mechanism 602 that is specifically designed for insertion into the inlet 604 of the filler pipe 606 a gas tank of a vehicle. The adapter mechanism 602 has a hollow cylindrical main body 608 having a diameter suitable to fit into the inlet 604 of the filler pipe 606 of the gas tank of a vehicle. At the top end 608t of the hollow cylindrical main body 608 is a male threaded portion 609 that has the same size and pitch of thread as does a conventional portable gasoline tank. A swivel nozzle assembly 610 is attached to the bottom end 608b of the hollow cylindrical main body 608 by means of a swivel joint 612, wherein an enlarged top portion 613 of the swivel nozzle assembly 610 is received in pivoting relation within an annular recess 614 having a defining inner wall 615 with a partial circular cross section. The swivel nozzle assembly 610 has a plurality of vent holes 616 therein and also has a main aperture 617 at its bottom end 617b.

[00075] The purpose of the cylindrical main body 608 and the swivel nozzle assembly 610 is to push open the hinged shutter at the inlet 604 of a filler pipe 606 of the gas tank of a vehicle, and also to preclude the liquid intake hose 651 from being cut or otherwise damaged by any sharp edges on or around the hinged shutter. Further, the swivel nozzle assembly 610 permits the adapter mechanism 602 to accommodate various shapes of filler pipes by pivotting as indicated by arrow "C" in Figure 26.

[00076] A sealing cap 618 is engaged in snug yet rotatable and slidable relation on the hollow cylindrical main body 608. Preferably, there is about 0.002 inches clearance between the outer surface of the cylindrical main body 608 and the inner surface of the sealing cap 618, so as to permit rotational and sliding movement of the sealing cap 618 with respect to the cylindrical main body 608, and also provide a substantial seal so as to preclude the passage of air therebetween. In this manner, excessive air pressure within the gasoline tank of the vehicle will force the cylindrical main body 608 outwardly until the narrower cross-section swivel nozzle assembly 610 is at the sealing cap 618, thereby creating a clearance between the sealing cap 618 and both of the cylindrical main body 608 and swivel nozzle assembly 610, to thereby permit the excess air pressure to be relieved. The sealing cap 618 has a knurled top portion 618a and a threaded lower portion 618b having threads the same size and pitch as a gasoline tank cap that threadibly engages the cooperatingly threaded outer end of the inlet 604 of a filler pipe 606 of the gas tank of a vehicle. An "O"-ring 619 is disposed immediately below the top knurled portion of the sealing cap 618 so as to engage against the end surface of the inlet 604 of a filler pipe 606 of the gas tank of a vehicle in sealed relation therewith.

[00077] The fitting 660, which is the same as the fitting 60 in the first preferred embodiment, is inserted into the top end 608t of the hollow cylindrical main body 608. The generally centrally located annular flange 662 that divides the main body 661 of the fitting 660 into an insertable portion 663 and an exterior portion 664, ensures that the fitting does not fall entirely into the interior of the hollow cylindrical main body 608. An "O"-ring is disposed around the insertable portion 663 and immediately under the annular flange 662 so as to engage the top end surface of the cylindrical main body when the fitting 660 is in place.

[00078] A liquid intake hose 651 is connected at its liquid outlet end 651b to the liquid receiving nozzle 668 and extends downwardly through the hollow interior of the cylindrical main body 608 and through the hollow interior of the swivel nozzle assembly 610 and exits the swivel nozzle assembly 610 through its bottom aperture. The liquid intake hose 651 is of a suitable length to extend to the bottom of a gas tank in a vehicle.

[00079] The air supply hose 678 is connected in the same manner as in the first preferred embodiment to the air inlet nozzle 666 of the fitting 660. Similarly, the liquid transport hose 671 is connected in similar manner to that described in the first preferred embodiment to the liquid outlet nozzle 667.

[00080] In use, the fitting 660 is engaged into the open top end of the cylindrical main body of the adapter mechanism 602 and is secured in place by the cap 624 that threadibly engages the threads at the top end of the cylindrical main body.

[00081] In use, the inlet 604, as shown in Figure 24, of the filler pipe 606 of the gas tank of the vehicle is located and the bottom end 608b of the swivel nozzle assembly 610 pushes open the hinged shutter and is pushed into the interior of filler pipe 606, until the adapter mechanism 602 stops travelling or until the threaded top end of the cylindrical main body nears the inlet 604 of the filler pipe 606. The sealing cap 618 is then threadibly engaged into the cooperating thread at the inlet 604 of the filler pipe 606.

[00082] Once the adapter mechanism 602 is in place, the pump 630 is pumped so as to provide air flow through the air supply hose 678 and through the fitting 660 and into the hollow interior of the cylindrical main body and the swivel nozzle assembly 610. The air exits the swivel nozzle assembly 610 through the various openings in it and also through the end aperture, so as to thereby affect a positive air pressure in the gasoline tank of the vehicle. The positive air pressure in the gasoline tank of the vehicle causes

gasoline to flow from the gasoline tank, into the liquid intake hose 651, through the fitting 660, and into the liquid transport hose 671.

[00083] Cap 624, such as from a conventional portable gasoline can, fits over the fitting 660 and engages the thread at the top end of the cylindrical main body so as to secure the fitting in place.

[00084] Reference will now be made to Figure 27, which shows part of a seventh preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general reference numeral 700, according to the present invention. The seventh preferred embodiment pressure operable liquid pumping system 700 is similar to the sixth preferred embodiment pressure operable liquid pumping system 600 except for the inclusion of an additional body tube turning ring 707 on the cylindrical main body tube 708. The tube turning ring 707 permits easier turning of the cylindrical main body 708 and precludes the adapter mechanism 702 from falling into the filler pipe 706.

[00085] Reference will now be made to Figure 28, which shows a portion of an eighth preferred embodiment of the pressure operable liquid pumping system and method, as indicated by the general

reference numeral 800, according to the present invention. The eighth preferred embodiment pressure operable liquid pumping system 800 is similar to the first preferred embodiment pressure operable liquid pumping system 20, except that the liquid intake section 850 of the liquid delivery hose means 840 comprises an extension 851 of the fitting 860. In other words, the fitting 860 and liquid intake section 850 are all one intricately formed plastic molded unit.

[00086] It is also contemplated in the present invention that in the liquid delivery hose means, the liquid intake section and the liquid transport hose section could comprise a single section of hose passing through a borehole in the fitting. Also, it is contemplated that this single piece of hose could be disposed between the fitting and the mouth of the container, as long as a substantially sealed relation between the hose, the mouth of the container, and the fitting, could be realized.

[00087] It is also contemplated that the valve mechanism could be omitted; however, the liquid flow from a container would be controlled essentially from the air pressure within the container as caused by the air pump.

[00088] As can be understood from the above description and from the accompanying drawings, the present invention provides a

pressure operable liquid pumping system and method for pumping liquids from one container to another, wherein the pumping mechanism and the destination can be at a the same elevation or at a higher elevation than the source, for pumping gasoline from one container to another, and for pumping gasoline from a gasoline tank in a vehicle to a destination, all of which features are unknown in the prior art.

[00089] Other variations of the above principles will be apparent to those who are knowledgeable in the field of the invention, and such variations are considered to be within the scope of the present invention. Further, other modifications and alterations may be used in the design and manufacture of the pressure operable liquid pumping system and method of the present invention without departing from the spirit and scope of the accompanying claims.

I CLAIM:

1. A pressure operable liquid pumping system for pumping liquid from a container having an aperture to a destination, said pressure operable liquid pumping system comprising:

pump means for pumping air into said container;

a liquid delivery hose means for delivering liquid from said container to said destination and having, in seriatim, a liquid intake section having a liquid inlet and being insertable into liquid in said container such that said liquid inlet is in liquid receiving relation with said container, a fitting for engaging said aperture of said container in sealed relation, and a liquid transport hose section having a liquid outlet end, with said liquid intake hose section and said liquid transport hose section in fluid communication one with the other;

means for connecting said pump means in sealed air-delivery relation to said container at said aperture, thereby permitting delivery of air from said pump means into said container through said aperture, so as to thereby effect a positive air pressure in said container;

wherein said positive air pressure in said container causes said liquid to flow from said container, through said liquid delivery hose means, and to said destination.

2. The pressure operable liquid pumping system of claim 1, further comprising selectively operable valve means operatively mounted on said liquid delivery hose means.

3. The pressure operable liquid pumping system of claim 2, wherein said liquid transport hose section is connected at said liquid outlet end in sealed liquid receiving relation to said valve means, to permit delivery of liquid into said valve means.

4. The pressure operable liquid pumping system of claim 1, wherein said liquid intake section comprises of a liquid intake hose section.

5. The pressure operable liquid pumping system of claim 1, wherein said fitting has a liquid egress passageway disposed therein that connects said liquid intake section and said liquid transport hose section in fluid communication one with the other.

6. The pressure operable liquid pumping system of claim 5, wherein said liquid transport hose section comprises an individual

liquid transport hose having a liquid inlet end and a liquid outlet end and connected at said liquid inlet end in sealed liquid receiving relation to said fitting so as to be in fluid communication with said liquid egress passageway.

7. The pressure operable liquid pumping system of claim 1, wherein said fitting comprises a cylindrical main body and an annular flange.

8. The pressure operable liquid pumping system of claim 1, wherein said fitting comprises a tapered main body.

9. The pressure operable liquid pumping system of claim 1, wherein said means for connecting said pump in sealed air-delivery relation to said container at said aperture comprises an air inlet nozzle having an air ingress passageway, and an air supply hose connected in sealed relation to said threaded connector so as to be in air delivering relation to said container through said air ingress passageway.

10. The pressure operable liquid pumping system of claim 1, wherein said pump means comprises a manually operable air pump.

11. A pressure operable liquid pumping system for pumping liquid from a container having a first aperture and a second aperture, to a destination, said pressure operable liquid pumping system comprising:

pump means for pumping air into said container;

a liquid delivery hose means for delivering liquid from said container to said destination and having, in seriatim, a liquid intake section having a liquid inlet and being insertable into liquid in said container such that said liquid inlet is in liquid receiving relation with said container, a fitting for engaging said first aperture of said container in sealed relation, and a liquid transport hose section having a liquid outlet end, with said liquid intake hose section and said liquid transport hose section in fluid communication one with the other;

means for connecting said pump means in sealed air-delivery relation to said container at said second aperture, thereby permitting delivery of air from said pump means into said container through said second aperture, so as to thereby effect a positive air pressure in said container;

wherein said positive air pressure in said container causes said liquid to flow from said container, through said liquid delivery hose means, and to said destination.

12. The pressure operable liquid pumping system of claim 11, further comprising selectively operable valve means operatively mounted on said liquid delivery hose means.

13. The pressure operable liquid pumping system of claim 12, wherein said liquid transport hose section is connected at said liquid outlet end in sealed liquid receiving relation to said valve means, to permit delivery of liquid into said valve means.

14. The pressure operable liquid pumping system of claim 11, wherein said liquid intake section comprises of a liquid intake hose section.

15. The pressure operable liquid pumping system of claim 11, wherein said fitting has a liquid egress passageway disposed therein that connects said liquid intake section and said liquid transport hose section in fluid communication one with the other.

16. The pressure operable liquid pumping system of claim 15, wherein said liquid transport hose section comprises an individual

liquid transport hose having a liquid inlet end and a liquid outlet end and connected at said liquid inlet end in sealed liquid receiving relation to said fitting so as to be in fluid communication with said liquid egress passageway.

17. The pressure operable liquid pumping system of claim 11, wherein said fitting comprises a cylindrical main body and an annular flange.

18. The pressure operable liquid pumping system of claim 11, wherein said fitting comprises a tapered main body.

19. The pressure operable liquid pumping system of claim 11, wherein said means for connecting said pump in sealed air-delivery relation to said container at said second aperture comprises a threaded connector that engages a co-operating threaded nub that defines said second aperture, and an air supply hose connected in sealed relation to said threaded connector so as to be in air delivering relation to said container.

20. The pressure operable liquid pumping system of claim 11, wherein said pump means comprises a manually operable air pump.

21. A method of pumping liquid from a container having an aperture, to a destination, said method comprising the steps of:

connecting an air pump means in sealed air-delivery relation to said container through said aperture;

connecting a liquid delivery hose means in sealed liquid receiving-relation to said container at said aperture such that the inlet end of said liquid delivery hose means is submerged in liquid in said container;

pumping air into said container so as to cause said liquid to flow from said container, through said liquid delivery hose means, and to said destination.

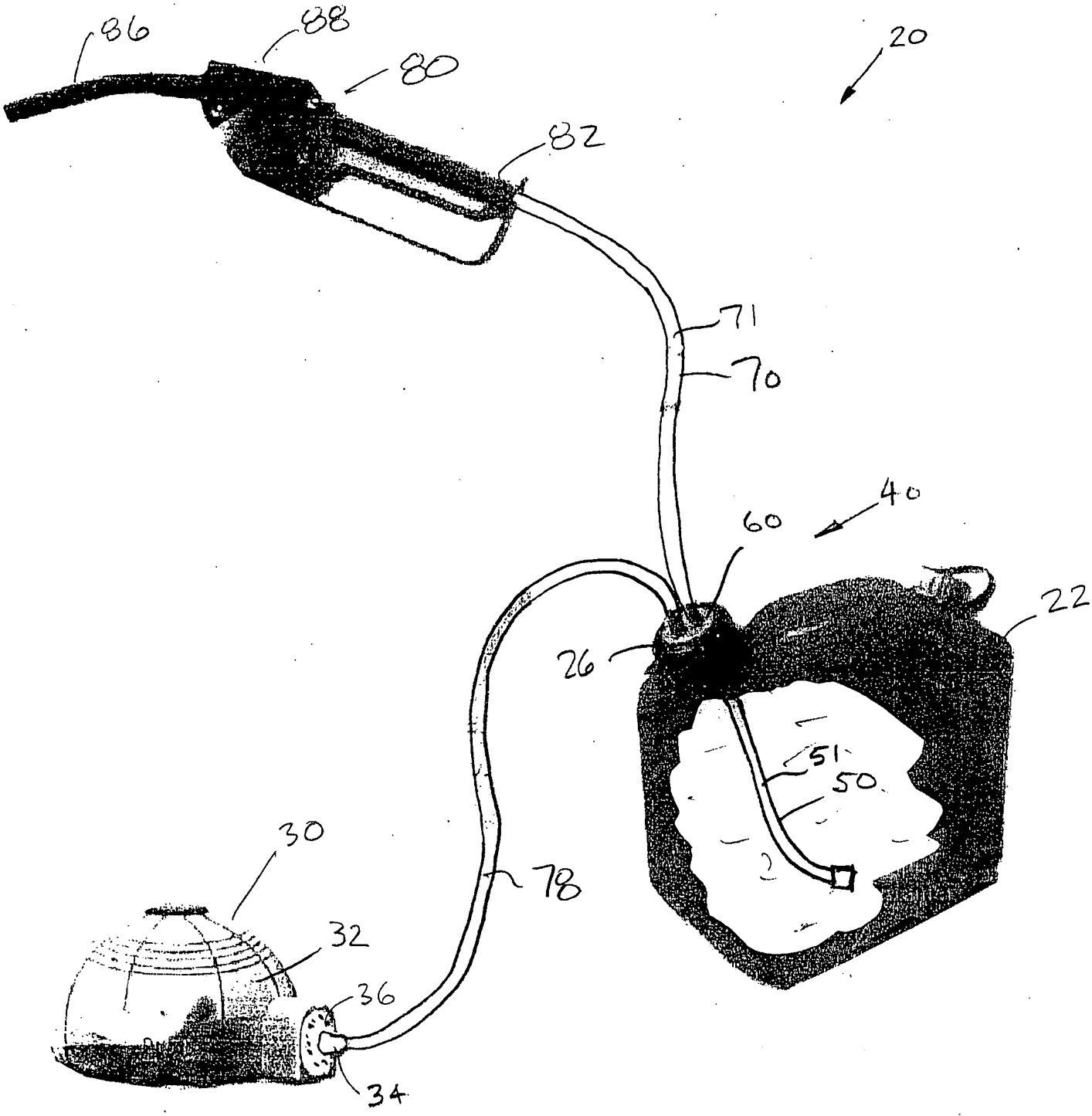


FIG. 1

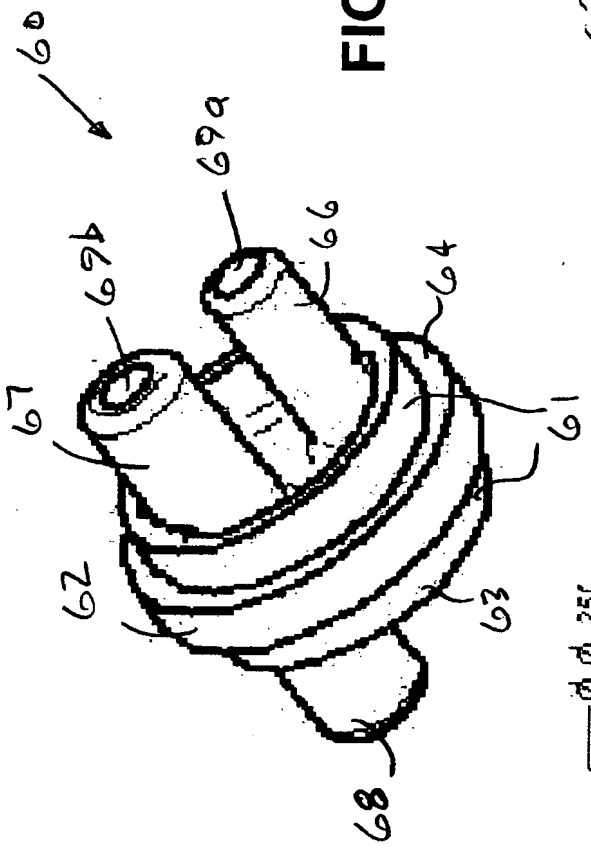


FIG. 2

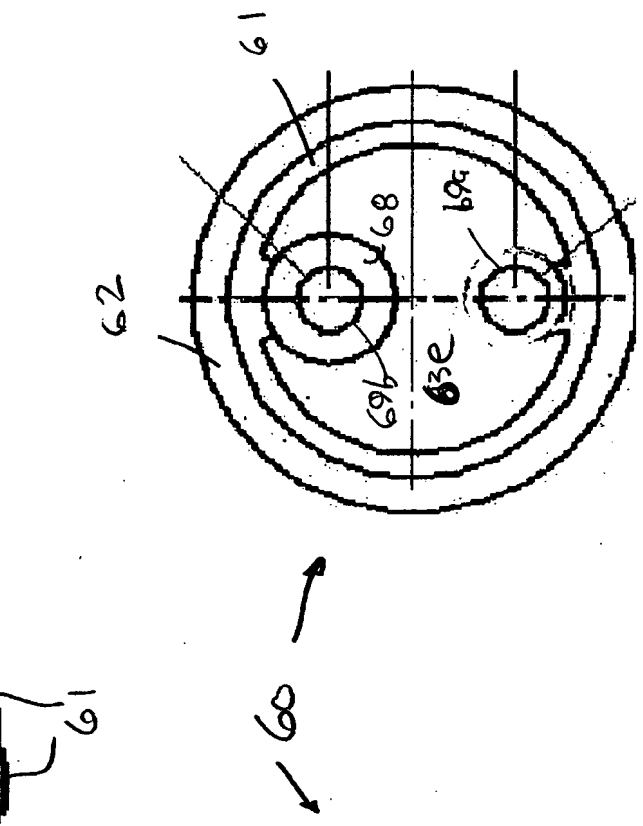


FIG. 4

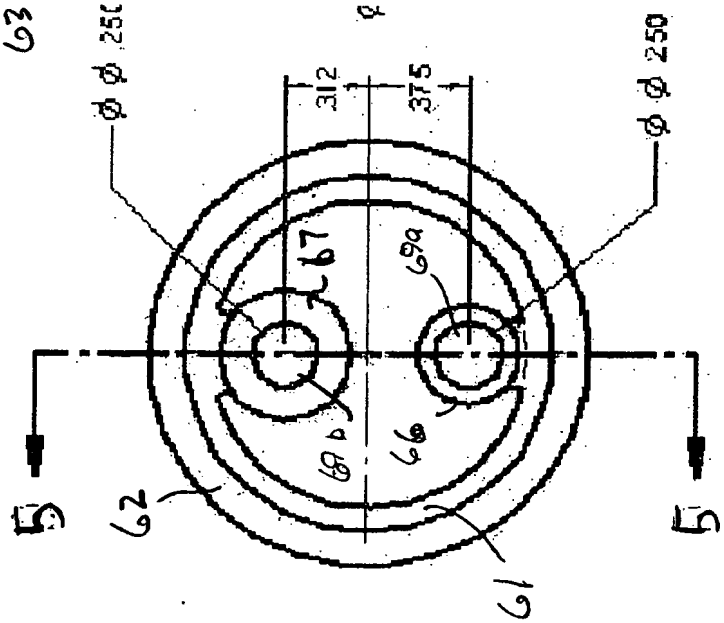


FIG. 3

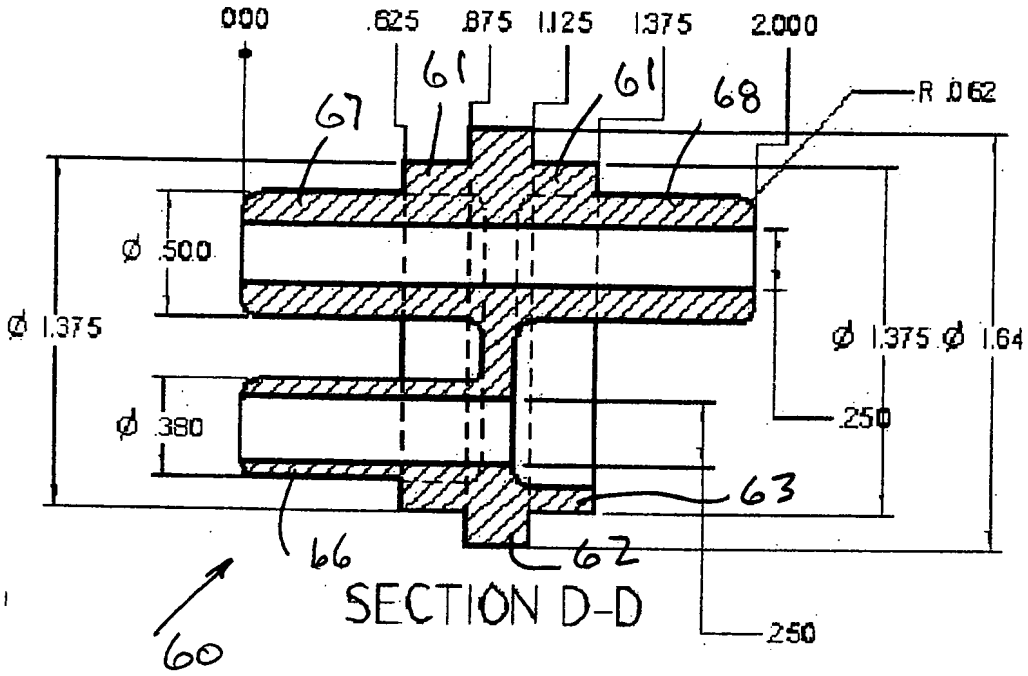

000
.625
.875
1.125
1.375
2.000
R .062
67
61
61
68
Ø .500
Ø 1.375
Ø 1.375
Ø 1.64
Ø .380
.250
63
66
62
SECTION D-D
250
60

FIG. 5

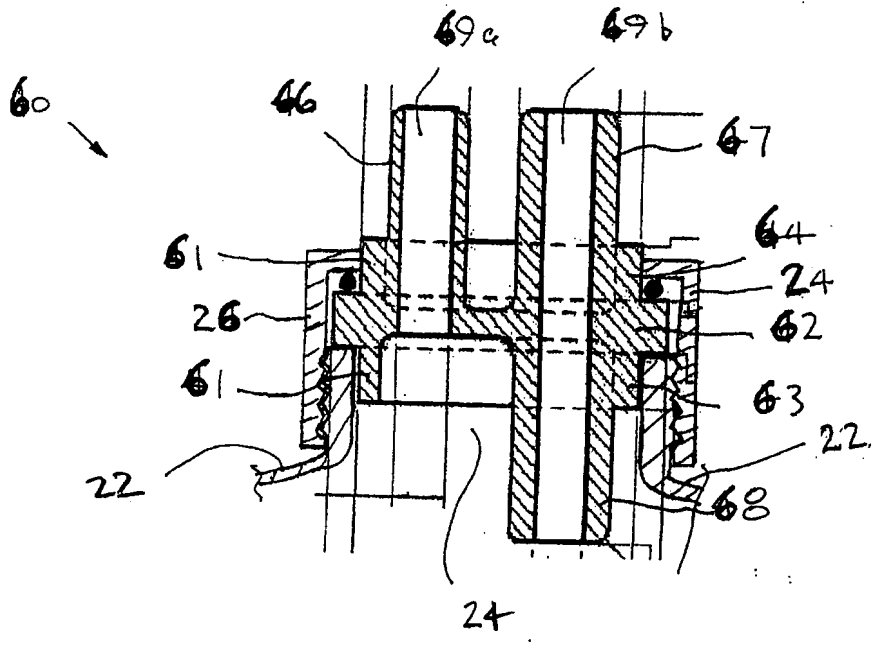

69a
69b
60
66
67
64
61
24
26
62
61
63
22
22
68
24

FIG. 6

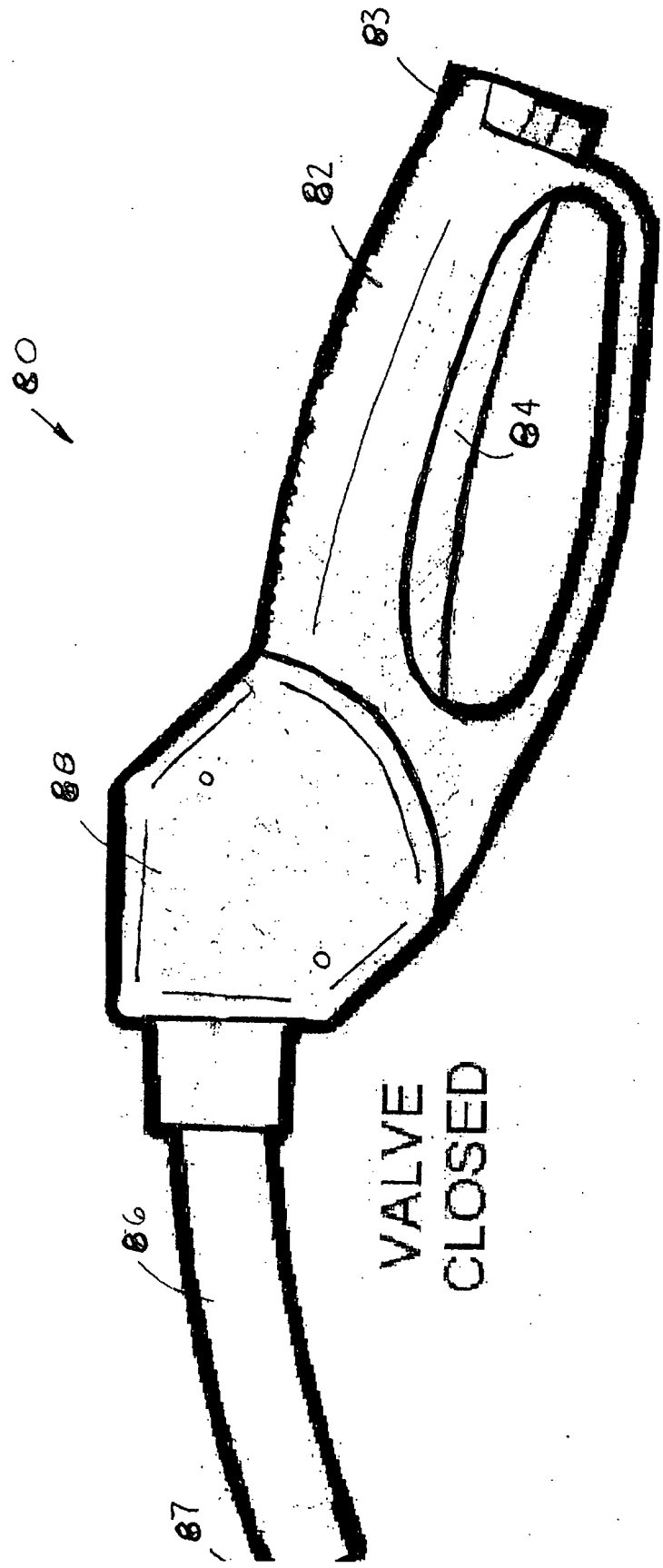


FIG. 7

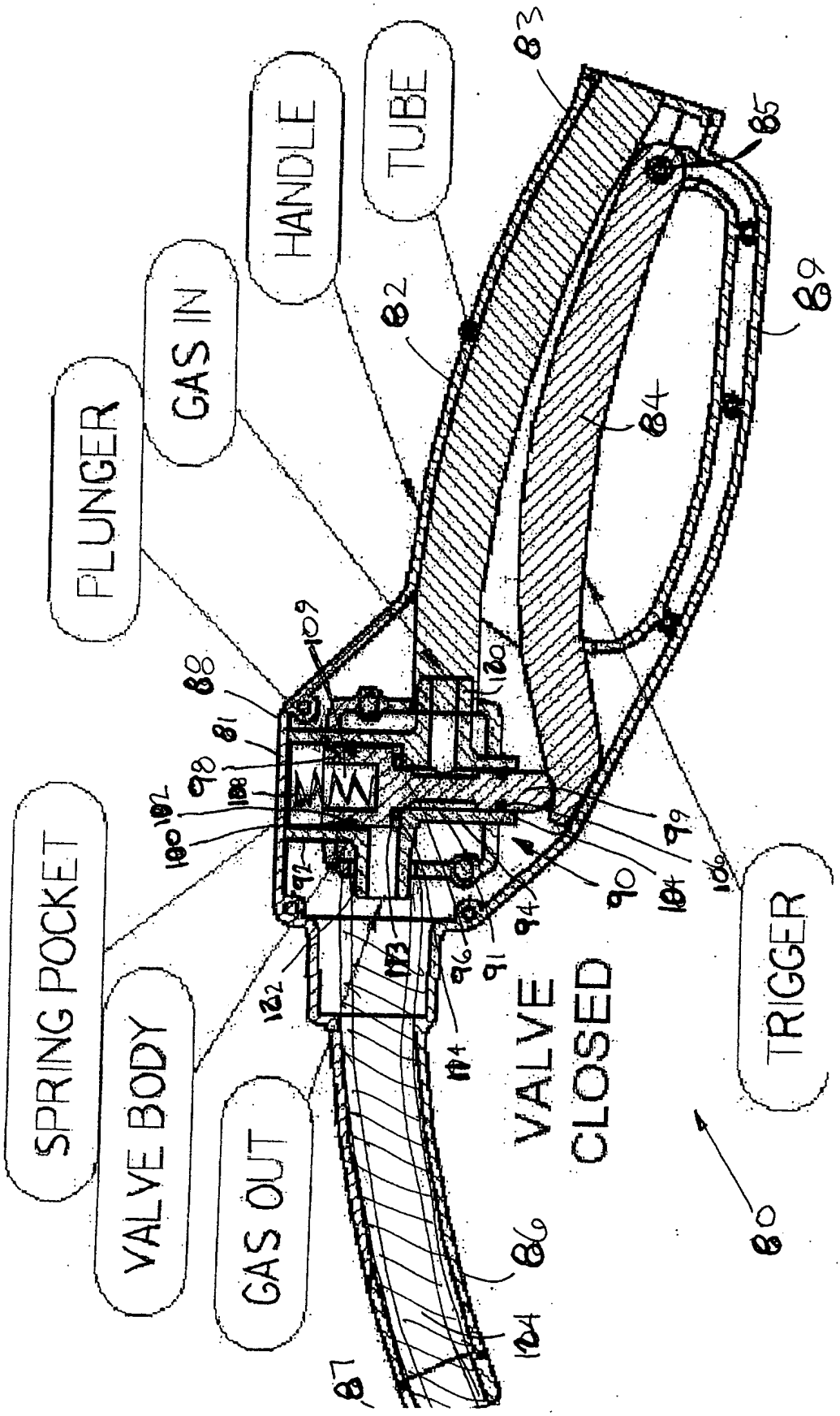

SPRING POCKET
VALVE BODY
GAS OUT
PLUNGER
GAS IN
HANDLE
TUBE
TRIGGER
VALVE CLOSED
80
81
82
83
84
85
86
87
88
89
90
91
92
94
96
98
99
100
102
104
106
107
109
120
122
124
126
128

FIG. 8

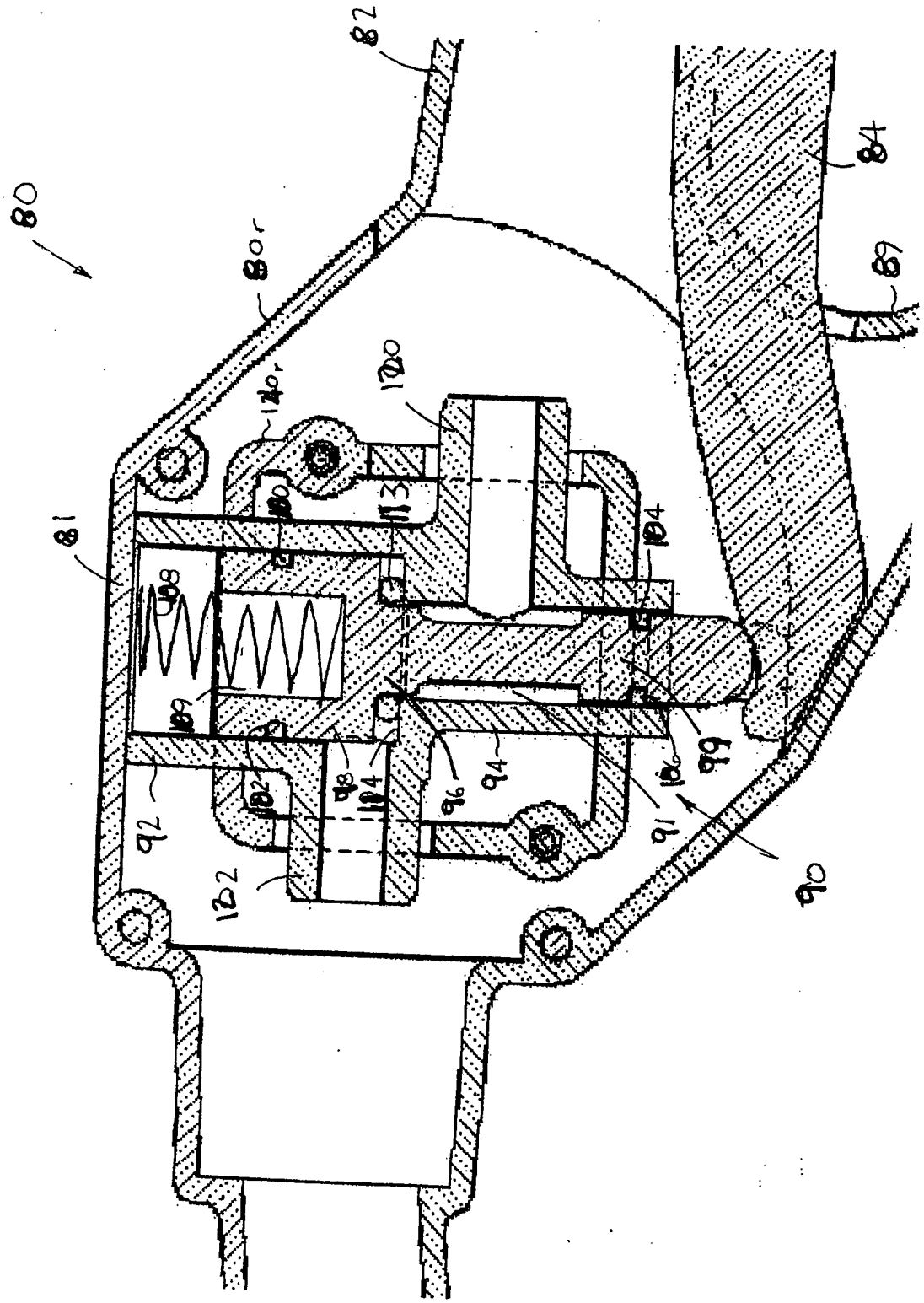

80
82
80r
84
89
120
140r
130
113
104
81
108
109
98
114
96
94
106
99
91
92
122
90

FIG. 9

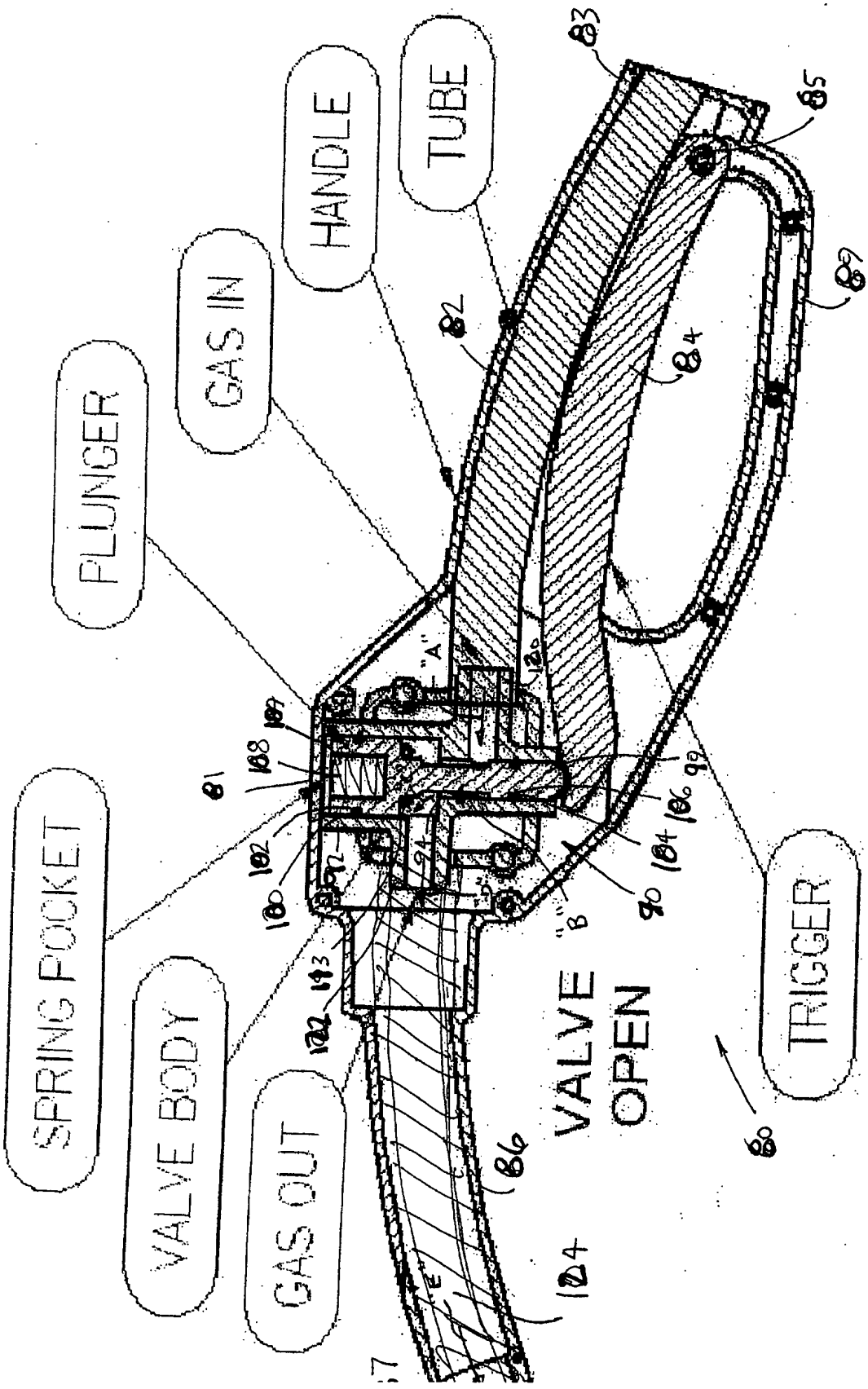

SPRING POCKET
VALVE BODY
GAS OUT
PLUNGER
GAS IN
HANDLE
TUBE
TRIGGER
VALVE OPEN
"A"
"B"
"E"
60
61
80
82
83
84
85
86
87
88
89
90
92
94
96
97
98
100
102
104
106
108
110
112
113
120
122
124

FIG. 10

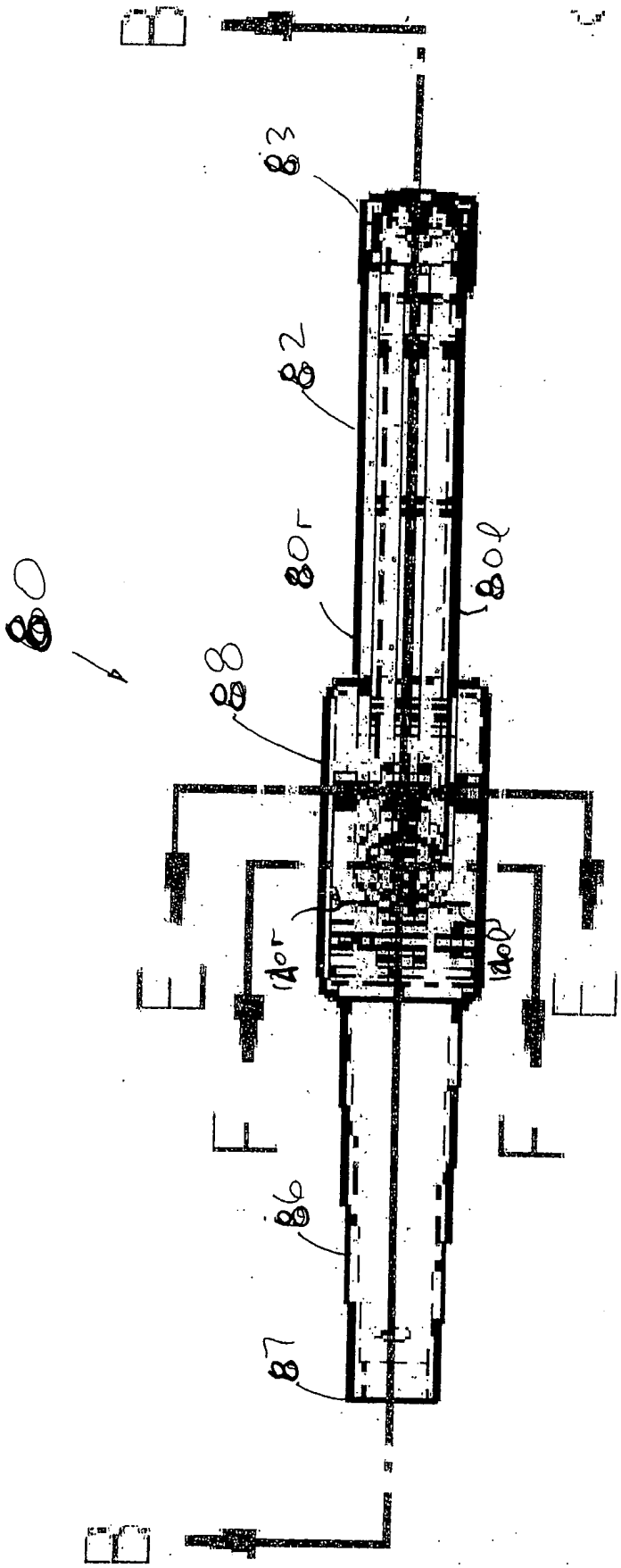
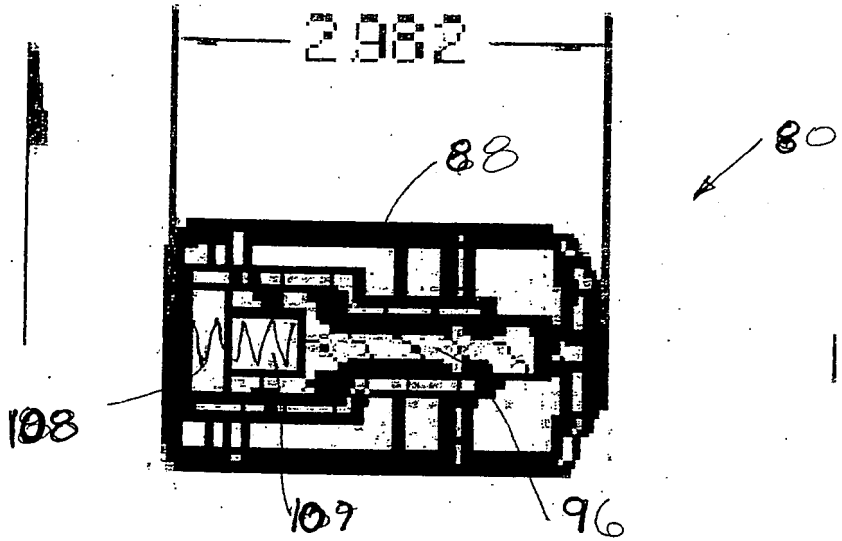
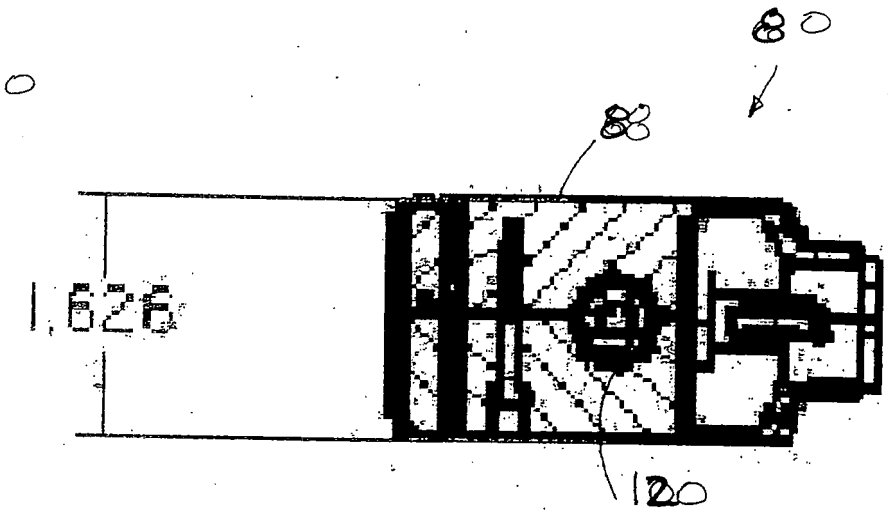


FIG. 11



SECTION F-F

FIG. 12



SECTION E-E

FIG. 13

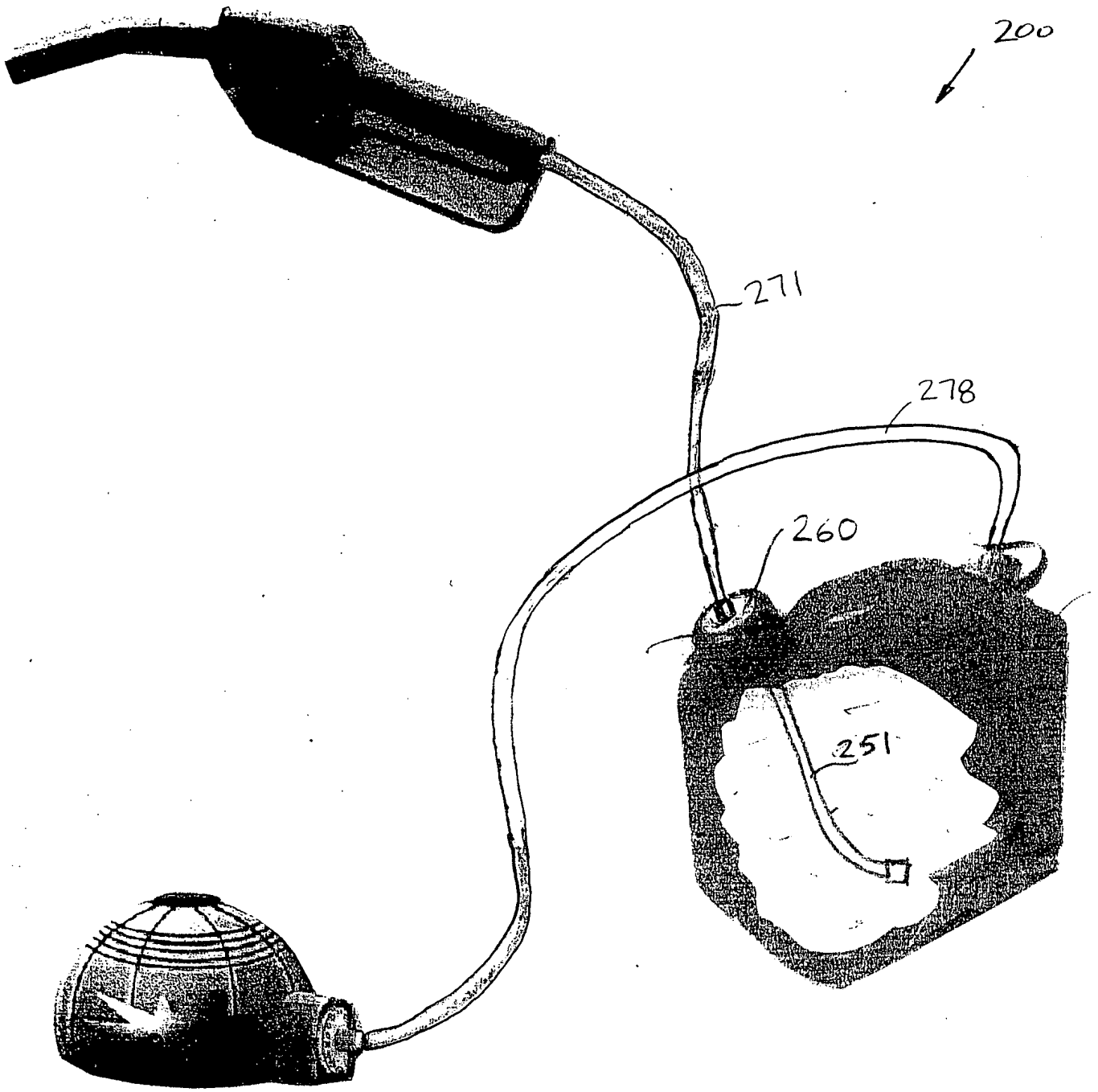


FIG. 14

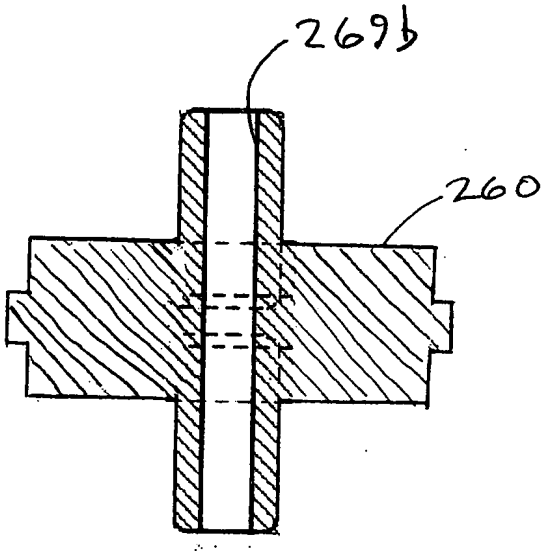


FIG. 15

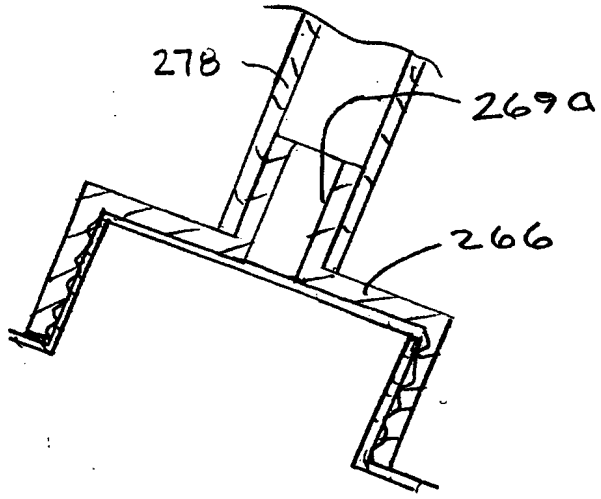


FIG. 16

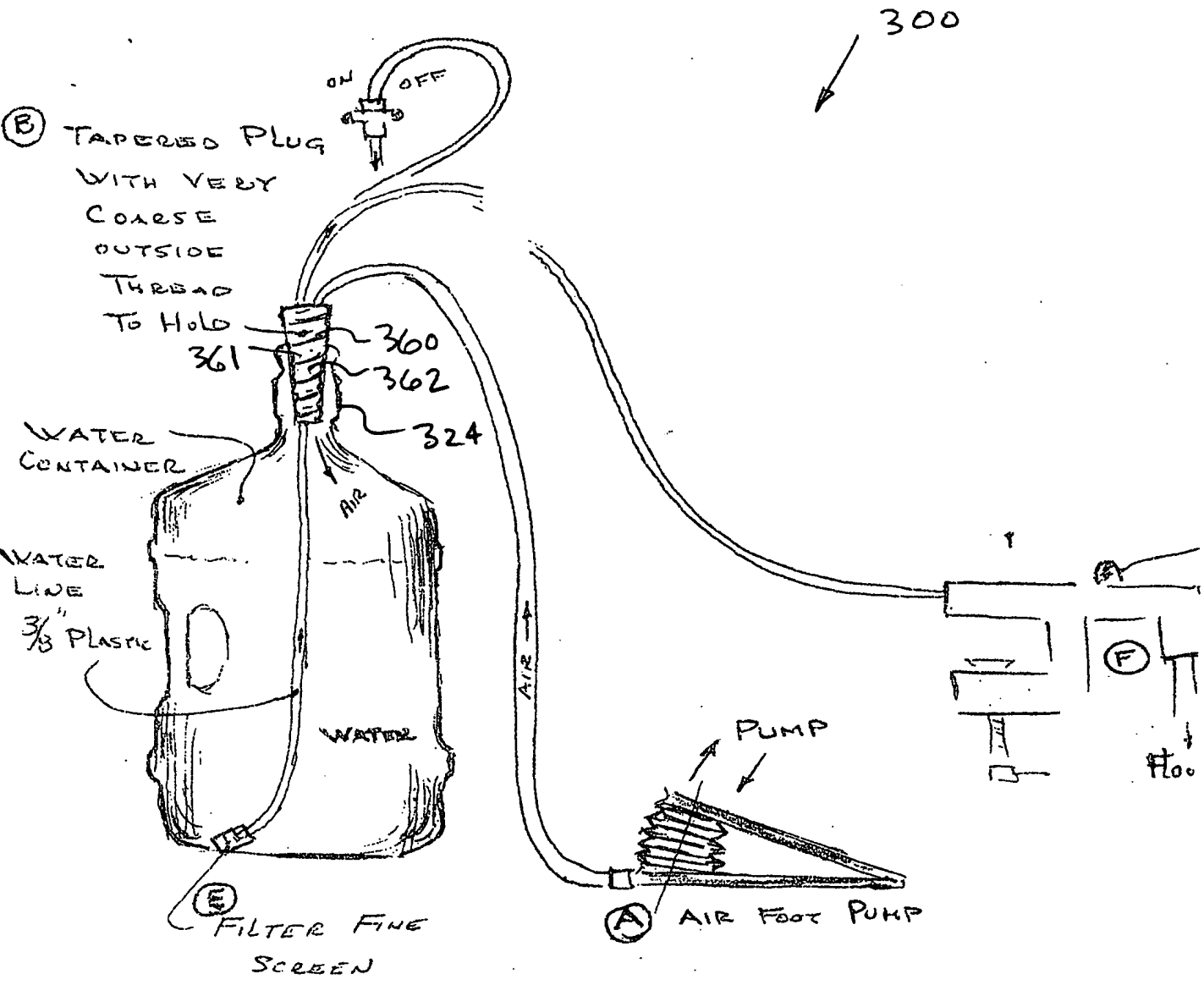

300
ON
OFF
(B) TAPERED PLUG WITH VERY COARSE OUTSIDE THREAD TO HOLD
360
361
362
324
WATER CONTAINER
AIR
WATER LINE
3/8" PLASTIC
WATER
AIR
PUMP
(F)
(E) FILTER FINE SCREEN
(A) AIR FOOT PUMP

FIG 17

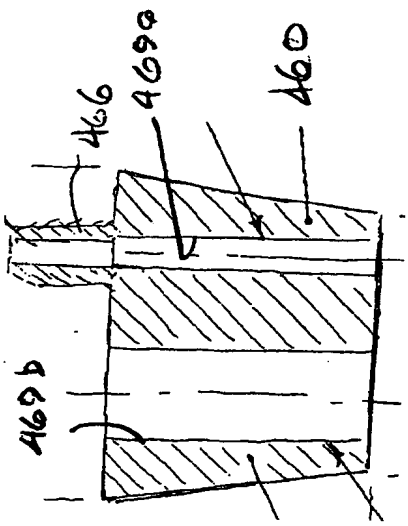


FIG 19

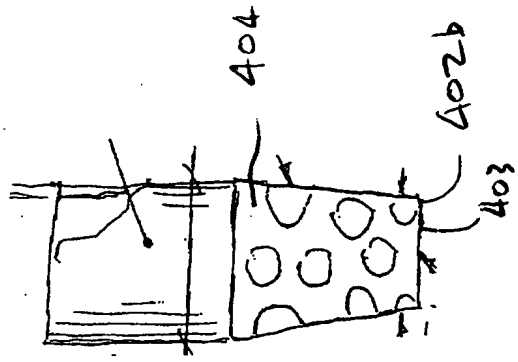


FIG 20

402 →

400

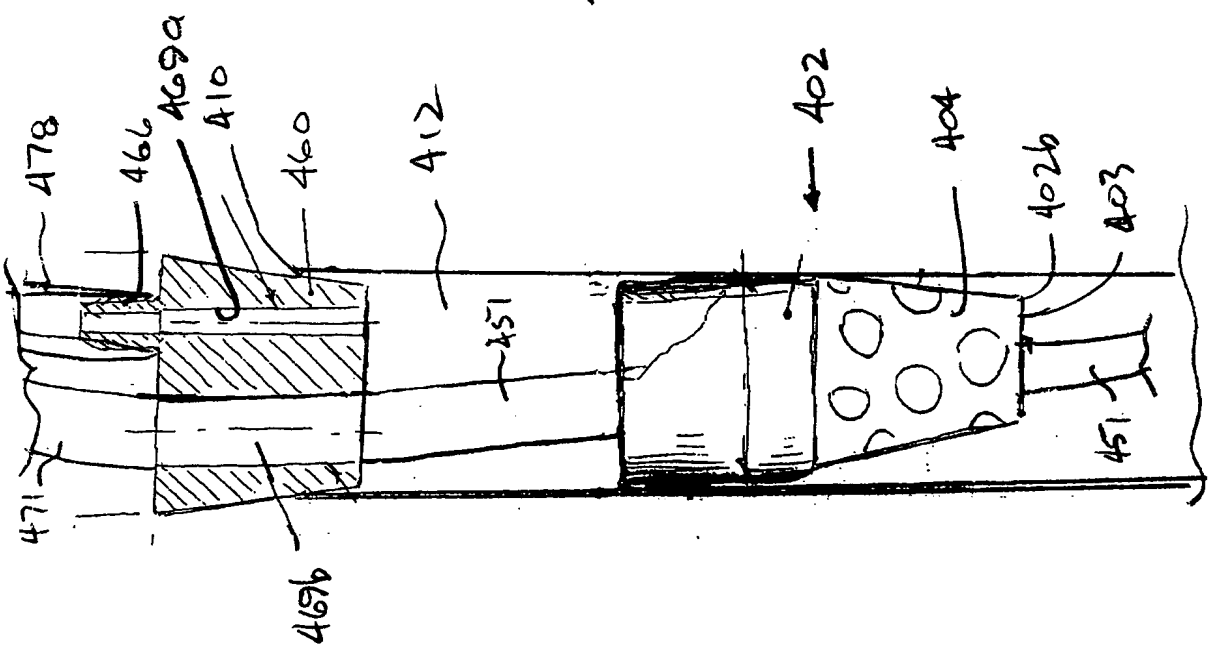


FIG 18

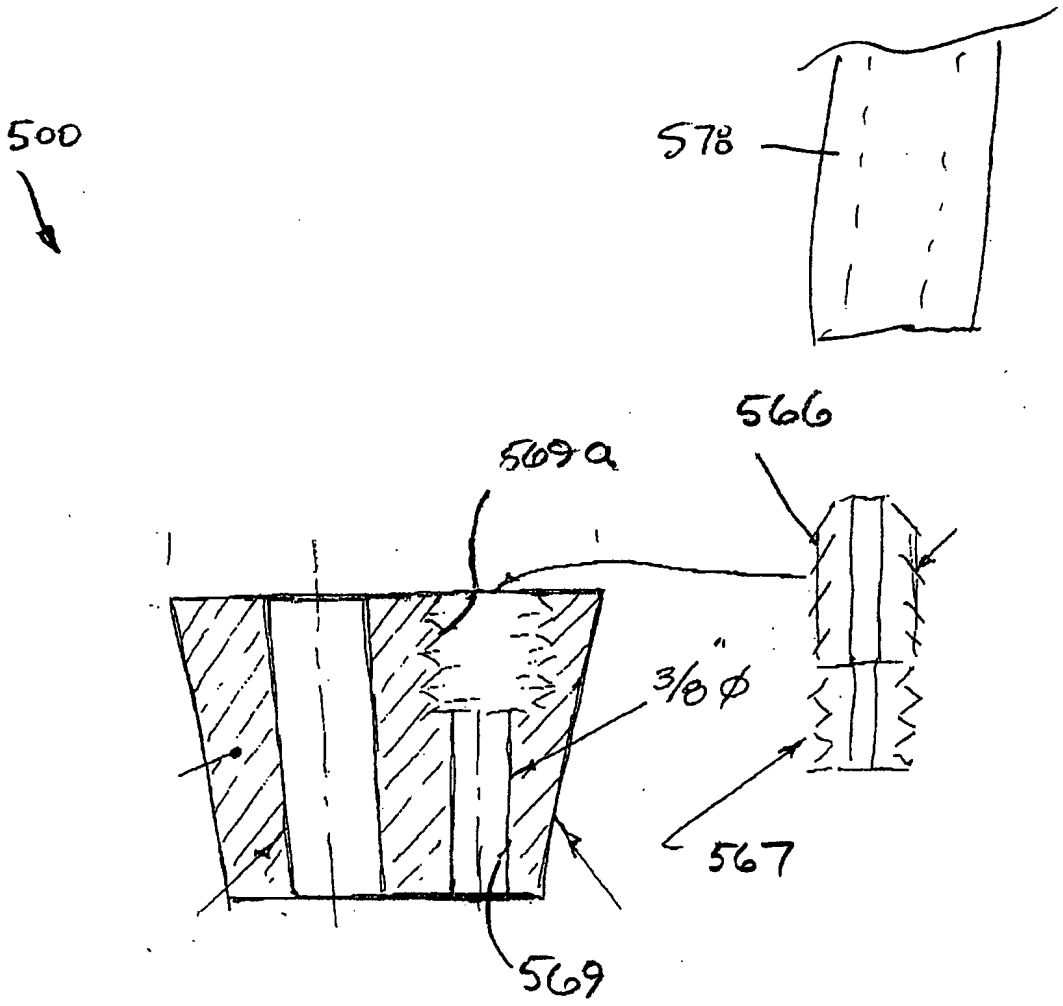


FIG 21

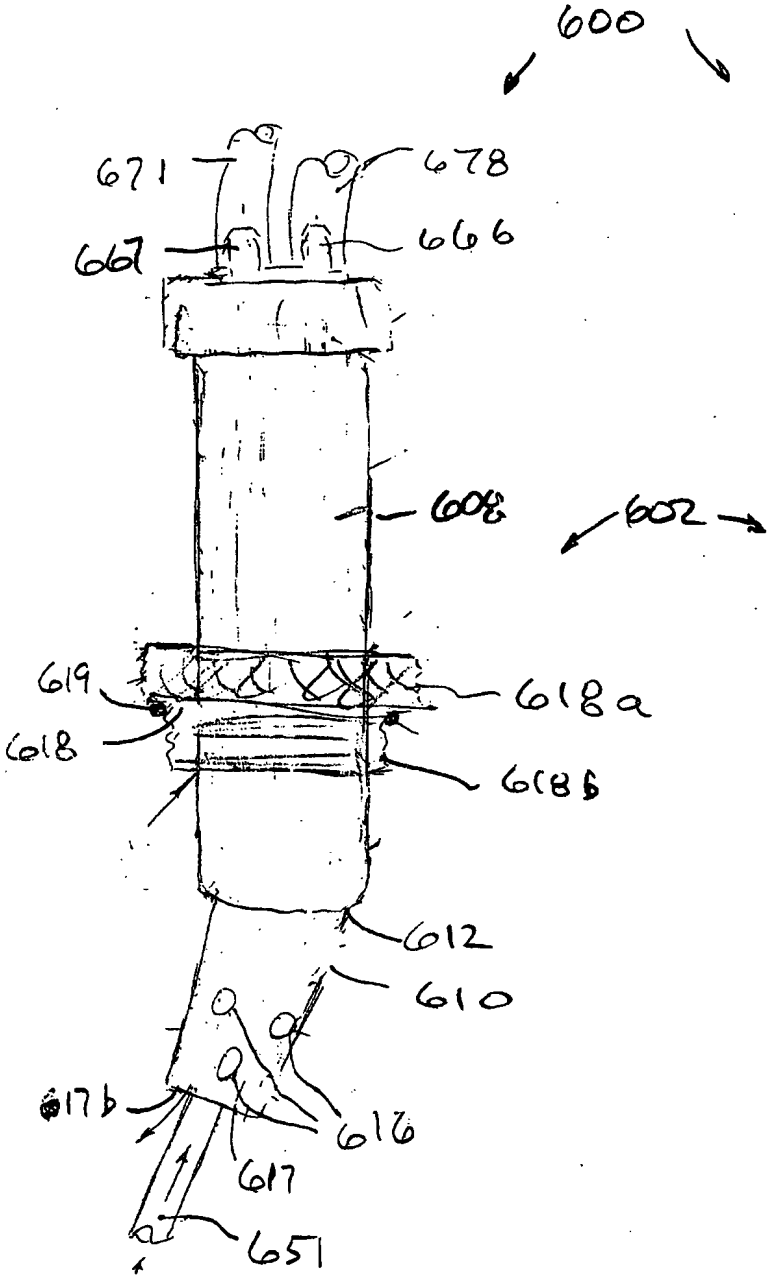

600
671
678
667
666
608
602
619
618a
618
618b
612
610
617b
616
617
651

FIG 22

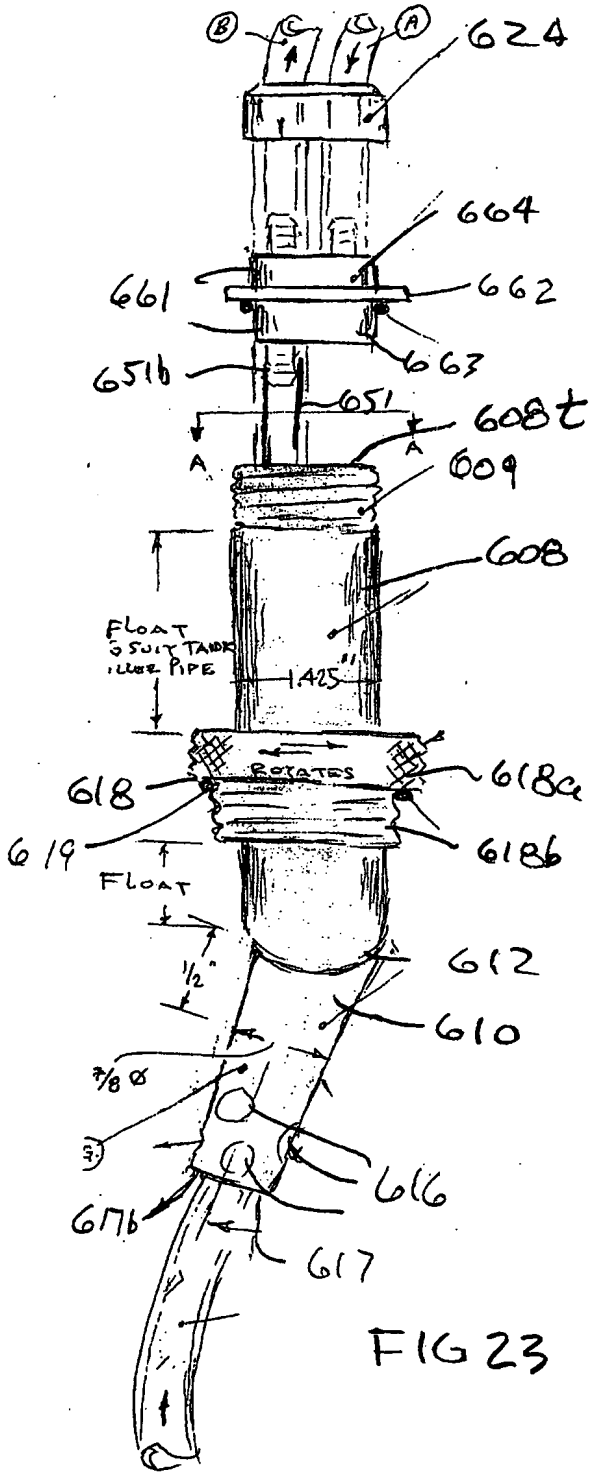

B
C
A
624
664
661
662
663
651b
651
608t
A
A
609
608
FLOAT
SUIT TANK
FILLER PIPE
1.425"
618
ROTATES
618a
619
618b
FLOAT
1/2"
612
610
7/8 Ø
616
617b
617

FIG 23

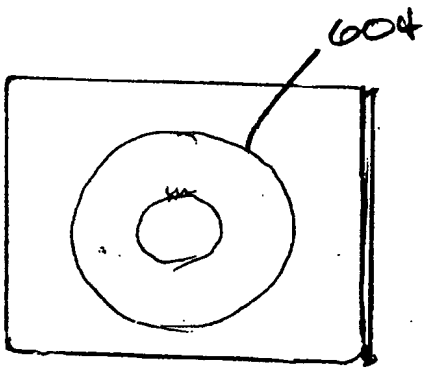


FIG 24

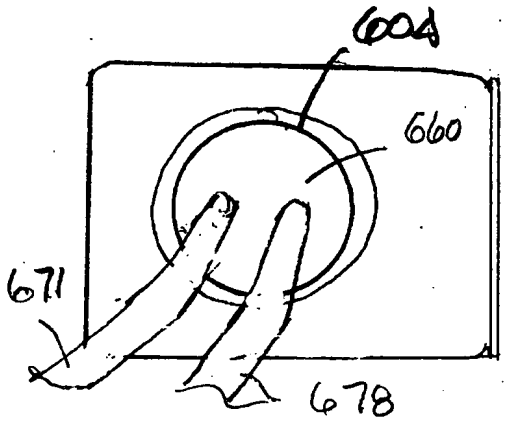


FIG 25

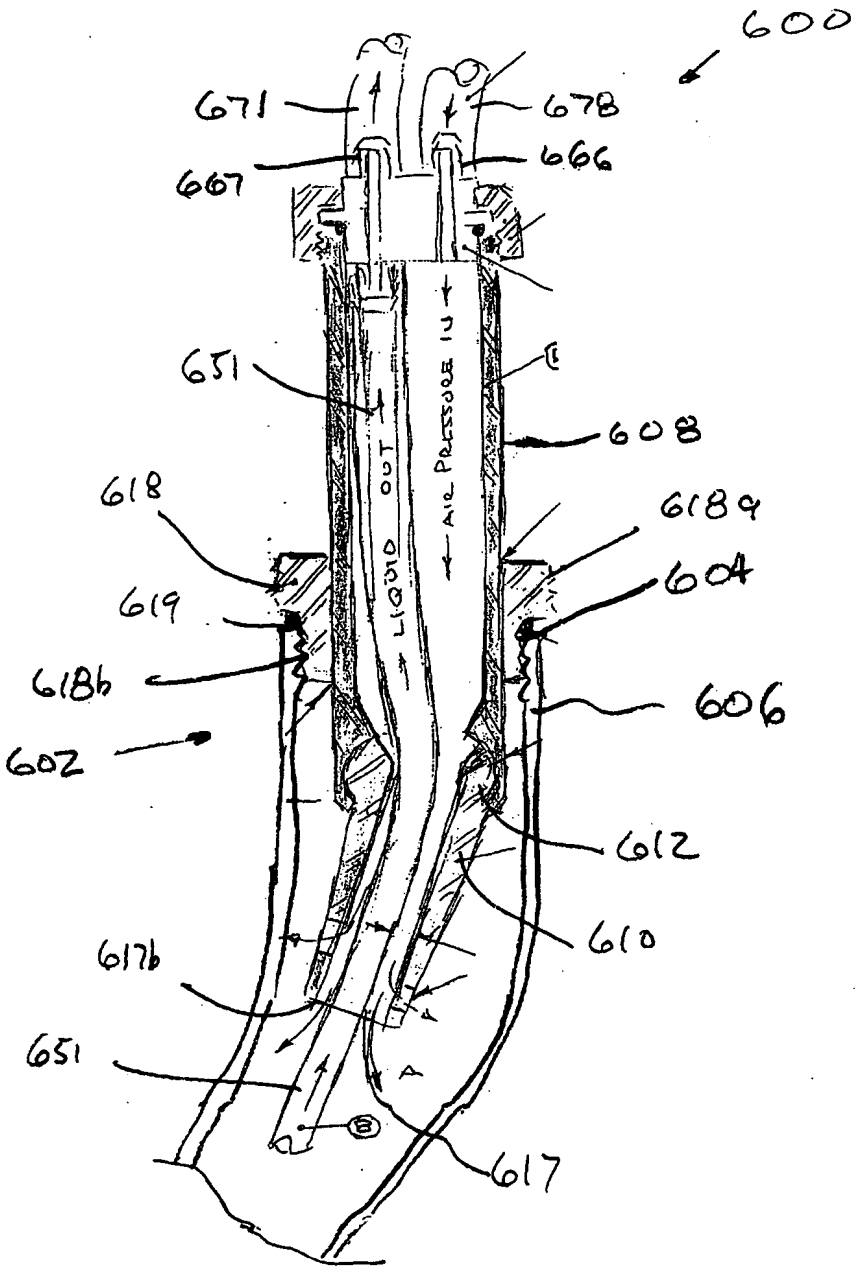
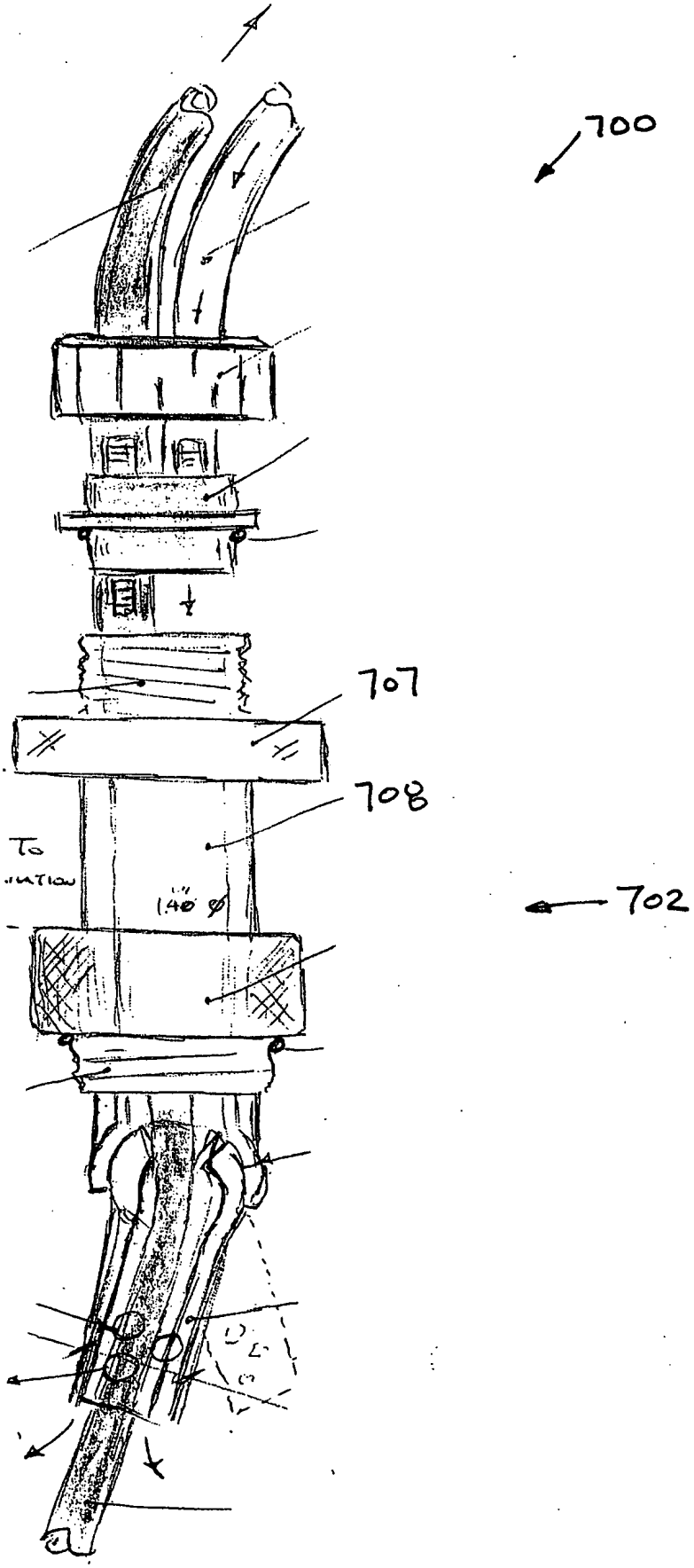

600
671
678
667
666
651
608
618
618a
619
618b
604
606
602
612
610
617b
651
617
LIQUID OUT
AIR PRESSURE IN

FIG 26

FIG 27



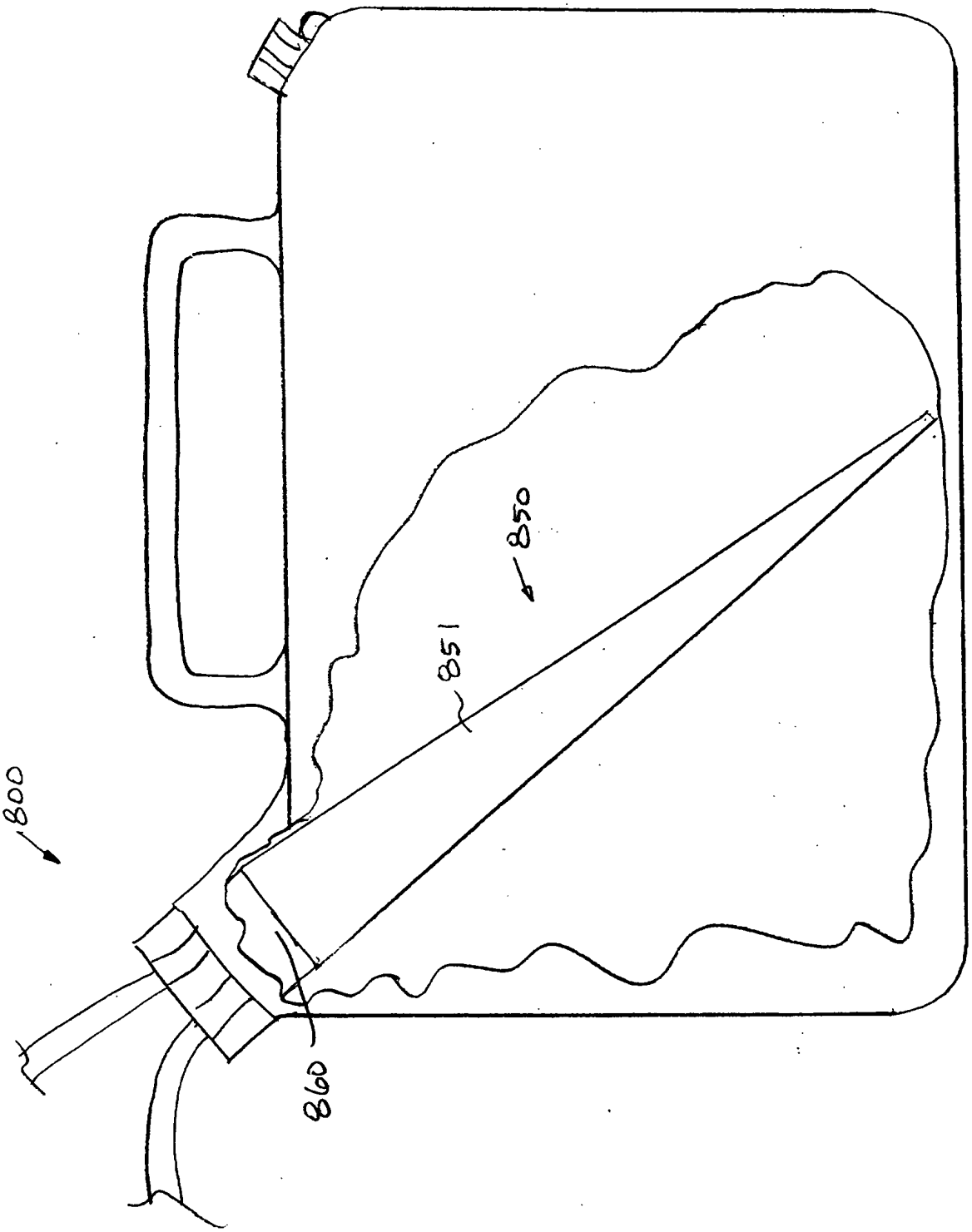


FIG 28